

Chemicals



The Community is the leading world manufacturer of chemical products with a turnover of about 290 billion ECU in 1990.

The chemical industry represents a major factor in the EC trade balance as it registered a surplus of almost 24 billion ECU in 1989.

After the second oil crisis, the beginning of the 1980s was marked by production stagnation and major over-capacity problems.

The sector then underwent thorough restructuring which has enabled it to benefit fully from the upturn in growth from 1983 onwards.

Between 1986 and 1989 growth was particularly rapid (about 5% per annum), but it slowed in 1990.

The prospects are good in the medium and long-term but the sector is faced with two major problems.

As an important consumer of petroleum products, both as an energy source and as raw materials, it is particularly sensitive to their cost.

Furthermore, the chemical industry is responsible for a certain number of problems with regard to the environment.

Therefore, its future is in danger of being considerably changed by the adoption of stricter policies at Community level on environmental protection.

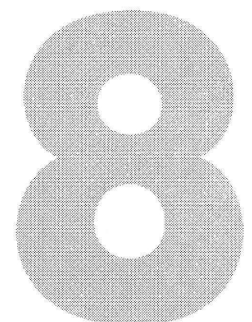
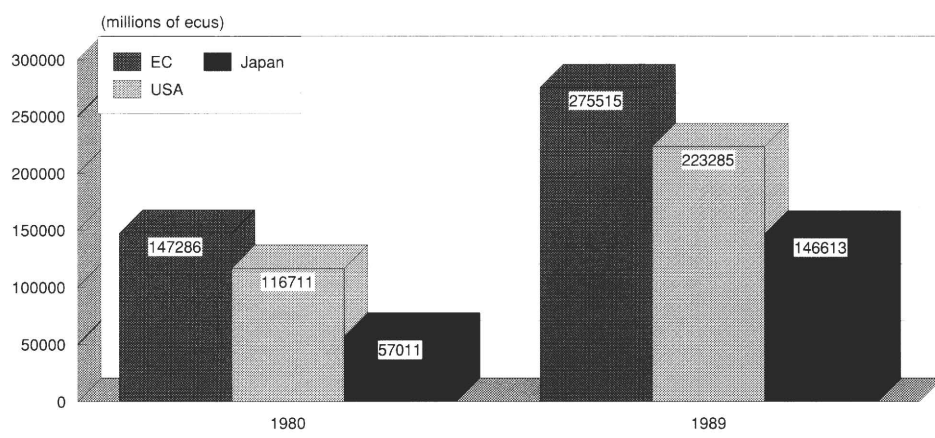


Figure 1
Chemicals
Turnover of the EC in comparison with the USA and Japan, 1980-89



Source: CEFIC, Eurostat, DRI Europe

The chemical industry within the European Community economy

Present situation The chemical sector represents about 10% of manufacturing industry's added value within the Community. In 1989, its production was 275 billion ECU, an increase of more than 8% over 1988. The Community is the largest world producer, far ahead of the United States (223 billion ECU) and Japan (147 billion ECU). If turnover has continued to increase in the EC and Japan since 1984, it has however markedly decreased in the United States between 1984 and 1987. Overall, 1989 was a good year for the chemical industry. Further to the acceleration of European growth, demand was sustained and real production increased by about 3.4%. The majority of chemical industry sub-sectors profited from this healthy cli-

mate with the notable exception of the fertiliser industry and certain petro-chemical products such as ethylene, butadiene and benzene. Pharmaceutical products, paints and generally all end-user products registered strongest growth. However, the industry suffered from a certain raw material price increase, notably that of oil. Furthermore, handicapped by high usage of its production capacities, it was not able to stop imports increasing more rapidly than exports. These two factors notably affected the petro-chemical industry.

Production and consumption Stagnation of demand at the beginning of the 1980's hit hard at an industry which had undertaken major investment during the previous decade. Company profitability, hit by over-capacity problems, dropped sharply. Thus the sector undertook drastic restructuring, accompanied by numerous redundan-

cies as well as output reduction. This restructuring enabled it to benefit fully from the upturn in demand from 1983 onwards. Since that date, with the exception of 1986, growth in real production has been strong. Between 1986 and 1989 annual growth was about 5%.

About 70% of chemical product demand stems from industry in the form of intermediate consumption, the remainder being basically destined for final consumption. The principal sector clients for the chemical industry are the plastics transformation industry, the textile industry, agriculture, and the chemical industry itself, which represents more than 30% of its own demand. This considerable auto-consumption is explained by the high degree of industrial vertical integration in which the downstream elements, refined chemicals or specialised chemicals are the almost exclusive outlets for components situated upstream; that is to say, basic chemicals. From a general point of view, the EC chemical industry has experienced rapid growth over the last two decades. Since 1970, production has increased on average by 3.5% per annum, whilst over the same period the average growth of manufacturing industry was 2%. Strong sector expansion can be explained in part by factors such as innovation and the replacement of traditional materials such as steel, wood, paper and glass by new materials derived from chemical pro-

Table 1
Chemicals
Main Indicators, 1980-90 (1)

(million ECU)	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990 (2)
Apparent consumption	137 621	151 302	162 216	174 148	198 244	214 148	207 117	214 542	241 543	265 255	269 764
Net exports	14 664	18 894	18 429	21 414	25 606	26 325	22 214	22 315	24 161	23 790	24 016
Turnover	152 285	170 196	180 645	195 562	223 850	240 473	229 331	236 857	265 704	289 045	293 790
Employees (000's)	2 097	2 040	1 961	1 912	1 905	1 905	1 910	1 910	1 922	1 941	1 945

(1) Excluding Greece; except fibres for Belgium, France, Spain, Ireland, Luxemburg; rubber and plastics industry included for Belgium and Spain

(2) Estimated

Source: CEFIC

Table 2
Chemicals
Turnover and foreign trade, 1980-90 (1)

(million ECU)	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990(*)
Turnover at current prices											
EC	152 285	170 196	180 645	195 562	223 850	240 473	229 331	236 857	265 704	289 045	293 780
Index	63	71	75	81	93	100	95	98	110	120	122
United States (2)	116 711	161 673	176 378	212 532	267 808	258 555	201 541	184 254	203 147	223 285	N/A
Index	45	63	68	82	104	100	78	71	79	86	N/A
Japan (2)	57 011	73 649	75 816	90 583	107 762	113 437	116 287	116 571	135 464	146 613	N/A
Index	50	65	67	80	95	100	103	103	119	129	N/A
Turnover at constant prices											
EC	206 906	208 785	207 869	218 140	234 455	240 473	240 282	250 418	271 441	280 398	282 090
Index	86	87	86	91	97	100	100	104	113	116	117
Trade at current prices (3)											
Exports extra-EC	27 329	32 923	34 273	39 581	47 705	51 656	45 879	45 922	51 185	56 123	60 726
Index	53	64	66	77	92	100	89	89	99	109	118
Imports extra-EC	12 665	14 029	15 844	18 167	22 099	25 331	23 665	23 607	27 024	32 333	36 710
Index	50	55	63	72	87	100	93	93	107	128	145
X/M	2.16	2.35	2.16	2.18	2.16	2.04	1.94	1.95	1.89	1.73	1.65
Imports intra-EC	43 127	38 828	37 166	43 101	50 899	60 789	60 543	64 200	73 070	82 762	N/A
Index	71	64	61	71	84	100	100	106	120	136	N/A

(1) Excluding Greece and fibres for Belgium, France, Spain, Ireland, Luxemburg; rubber and plastics industries included for Belgium and Spain

(2) Source : Association des fabricants en chimie (for the United States), Japan Chemical Industry Association

(3) 1980-84 EC9, 1985-88, excluding Greece

(*) Estimated

Source: CEFIC

cesses. This trend has enabled the EC chemical industry to increase its shares of industrial markets and to experience rates of growth higher than the average rates of manufacturing industries (growth premium, i.e. the difference in positive growth between chemical industry production and manufacturing industry production).

This observation remains valid even if the causes have changed. Whilst at the beginning of the 1960s innovation and traditional material substitution could be held responsible for half of the strong rate of expansion experienced at the time, being 10%; today only 1% of the growth rate of 4% can be attributed to this premium.

This differential decrease is only the consequence of the chemical industry's progressive evolution towards maturity.

For the chemical industry, oil products constitute at the same time the main raw material and an energy source. Producing 100 ECU of chemical products requires on average about 15 ECU of energy and oil

raw materials. The chemical industry is therefore strongly dependent on oil price fluctuations. So, for example, although a sharp decrease in turnover in 1986 was noted, further to a fall in the value of the dollar (minus 5% at current prices), the industry managed to maintain a high profitability level thanks to a fall in oil prices.

Employment The chemical industry directly employs 1.9 million people, being about 7% of the Community's manufacturing industry employment. The majority of employees in this sector have a high level of qualification and training. Like other sectors of manufacturing industry, since 1974 the chemical industry has had a diminishing labour force. From 1984, however, the start of a production upturn has led to a stabilisation of employee numbers. However, productivity since 1984 shows only an average annual growth rate of 3.5%, whilst in the past this rate was usually above 5%. This phenomenon probably relates to the dawning of a more mature growth period, with fewer pro-

ductivity gains, attributed to the greater proportion of higher added value chemical products; products representing smaller volumes.

Investment For 1989 investment expenditure was 18 million ECU against 15.3 million ECU in 1988, being a growth of almost 18%. Even if these figures are nominal values, they do reflect a considerable increase in investment volume, of the order of 8.5% by volume (CEFIC data). Furthermore, the sector is showing a nominal investment growth greater than 10% per annum since 1985.

The greatest proportion of investment expenditure is at present directed towards productivity improvements, new product introduction and production processes, computerising production unit operation, safety and environmental protection.

One example is investment by the Community chemical industry in the electronic data interchange (EDI). The product aims at establishing a pan-European system for electronic transmission of commercial docu-

Table 3
Investment expenditure
within the EC chemical industry

	Billion ECU	As a % of total turnover
1985	10 553	4.4
1986	12 024	5.2
1987	13 266	5.6
1988	15 305	5.8
1989	18 010	6.2

Source: CEFIC

ments between chemical companies and their financial partners.

Extending existing production units and the construction of new units was not, until recently, a top priority. Furthermore, the petro-chemical industry does not foresee any major change in basic technology even if efforts are being pursued for innovation in terms of production processes and products. However, because of the restructuring undertaken at the beginning of the 80's and high market demand, investment profitability has returned to acceptable levels and this can now justify installing additional production capacity to respond to the need to preserve competitive status on a world scale.

The rate of investment (representing percentage of investments in relation to turnover) has decreased during the two recessionary periods in the 70's and at the beginning of the 80's. This phenomenon is due as much to the absence of large investment projects as to a disproportionate growth in turnover caused by high price increases. Since 1984, this portion has once again increased from 4.4% in 1985 to 6.2% in 1989. This evolution is an indication of the good health and the promising future of the industry.

Sector description

The chemical industry is an industrial branch of very heterogeneous character in

which the main activities consist of chemically transforming materials to diverse substances, giving them new physical and chemical properties. For these activities, the chemical industry employs raw materials from the petroleum, mining and extractive industries such as oil, minerals, metals, but also certain agricultural products. The main activity sectors correspond to the following product groups:

- ❖ basic chemical products;
- ❖ fertilisers and nitrogen compounds;
- ❖ plastic in primary form and synthetic rubber;
- ❖ pesticides and other agro-chemical products;
- ❖ paints, varnishes and other similar coating products, inks and fillers;
- ❖ pharmaceutical and medical products, botanical products;
- ❖ soaps and detergents, cleaning and polishing preparations, perfumes, toilet preparations
- ❖ man-made fibres

The industry comprises two upstream branches constituting basic chemicals (basic inorganic chemicals and basic organic or petro-chemical chemicals) and a series of downstream branches such as pharmaceutical products, agro-chemicals, detergents,

etc.... The upstream sectors' outlets are almost exclusively the downstream sectors, which themselves supply either other industries (agriculture for agro-chemicals, the plastics transformation industry for plastics in primary form...), or the end-user (soaps and detergents for example).

The role of the basic chemical industry is to transform raw materials into products or substances usable by the other chemical sectors. This includes what are generally called organic chemicals and inorganic chemicals or basic chemicals.

In 1989, basic chemicals overall represented 27% of total chemical production. Figure 3 shows the influence on the downstream sectors.

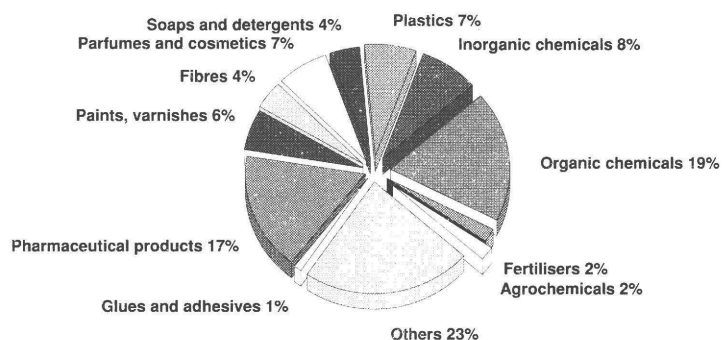
Inorganic chemicals mainly use minerals and hydrocarbons as raw materials. Plastics, as well as fertilisers, are two large consumers of inorganic chemicals.

The principal products of inorganic chemicals are ammonia, nitric, sulphuric and phosphoric acid, sodium bicarbonate, carbon and sodium hydroxide.

As for petro-chemicals, here mainly hydrocarbons are used, both as a raw material and as an energy source.

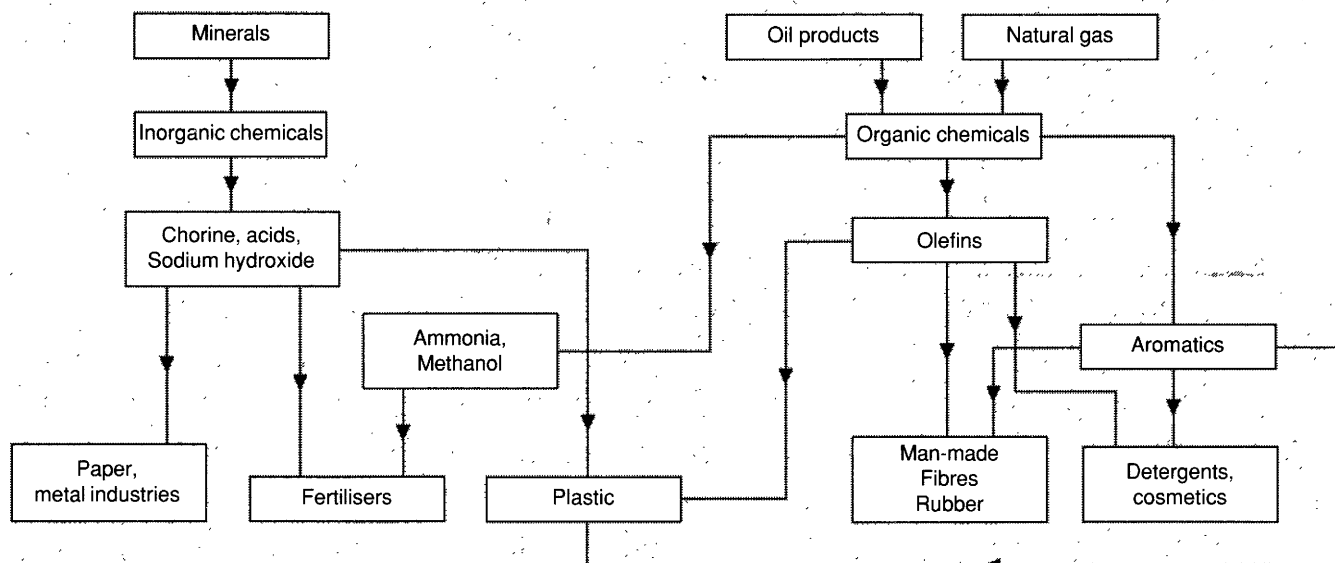
The petro-chemical industry produces a wide range of products used in plastics,

Figure 2
Chemicals
Industry comparison, 1989
% of production



Source: CEFIC, Eurostat, DRI Europe

Figure 3
Chemical industry production process



Source: DRI Europe

fibres, paints, detergents, pesticides, pharmaceutical products.

Industry structure

Whilst about 9,000 chemical companies operate in the EC, the chemical industry remains a concentrated industry. According to a survey by the European Commission, five companies share more than 40% of the EC production. Amongst the ten foremost world chemical companies, no fewer than seven are European. Amongst the 30 foremost world chemical companies, 17 are European (of which 13 are based in the EC), 10 are American and 3 are Japanese (Chemical Insight no. 422, September 1989).

The sector is therefore dominated by European companies. The EC chemical industry turnover represents 28% of the world turnover in this industrial sector. Recently American companies have experienced high growth rates, thanks to an increase in domestic demand but also due to an increase in exports linked to the weak dollar.

New producers have appeared on the

world stage, particularly in South East Asia, but also in Brazil and the Middle East. However, the major share of production remains by far in the hands of the European and American groups.

During the 1960's and up to the middle of the 1970's, the chemical groups' basic strategy aimed at developing output.

The 1970's economic crisis led to a major downscaling of prospects, highlighting the need to restructure the industry.

Company strategies were thus modified along the following lines:

- Production rationalisation; this rationalisation was translated into major redundancies which continued after the upturn in demand;
- Companies returning to their basic business; this trend is of course not specific to the chemical industry;
- Increasing installation size, notably due to re-siting activities in order to benefit from the economies of scale;
- Activity movement towards refined chemicals, with greater added value than basic chemicals; being less sensitive to econ-

omic climate fluctuations.

This restructuring has led to intense merger and acquisition activity. According to a European Commission report, between 1984 and 1988 25% of mergers and acquisitions carried out in the Community related to chemical industry companies.

This percentage is even higher if one only considers operations of an international nature or those linked to large organisations, for example, if account is taken of the French chemical industry restructuring, with Orkem passing to Elf Aquitaine and Total, the Italian chemical industry restructuring with the creation of Enimont by the fusion of the Enichem and Montedison activities, and the restructuring of the pharmaceutical industry with the creation of Smith Kline Beecham. During the 1980s, EC groups worked at consolidating their positions in North America by acquiring local factories and developing exports. The high growth Asiatic countries became a new target for American and European companies which, three years ago, signed a large number of joint venture agreements with local firms.

Table 4
Chemicals
The 10 leading EC companies 1989

(Million ECU)	Country	Turnover	Employees
BASF	BR Deutschland	23 015	136 990
Hoechst	BR Deutschland	22 184	169 295
Bayer	BR Deutschland	20 927	170 200
ICI	United Kingdom	19 599	133 800
Rhône-Poulenc	France	10 409	86 024
Enimont	Italia	10 169	52 656
Akzo	Nederland	8 028	70 900
Smithkline Beecham	United Kingdom	7 287	55 000
Solvay	Belgique/België	5 926	45 011
Henkel	BR Deutschland	5 625	38 145

Source: Le Nouvel Economiste

There are major structural differences within the chemical industry, notably between basic chemicals and refined chemicals. Concentration is clearly higher within basic chemicals, the exclusive domain of large companies, as opposed to refined chemicals.

As an example, in the Federal Republic of Germany six producers share 80% of inorganic chemical production. In the case of petro-chemicals, this share is more than 75%. At Community level, the majority of large chemical groups have petro-chemical operations. Amongst the ten leading EC producers, only two are not active in this sector (Ferruzzi and Solvay). This strong concentration is explained by the existence of economies of scale and capital requirements much higher than in other sectors of

the chemical industry. Competition is however much more intense in basic chemicals than might be believed from the strong concentration. Apart from the need for heavy capital investment, entry barriers are in the main rather weak. In fact, product differentiation possibilities are limited. R&D and knowhow have less importance than in the refined chemical industry, and do not confer decisive competitive advantage. The niche phenomenon witnessed in the refined chemical industry does not exist in the basic chemical industry. Therefore, the latter experiences a high potential for competition amongst the present producers on the market and the threat of the arrival of new competitors. This threat has become particularly apparent during the latter years with the arrival

of new producers from the oil-producing countries as well as from South East Asia.

Production distribution within the Community

The proportion of turnover within the GDP of each Member State is shown in Figure 5. This figure shows that, proportionally, Spain, Belgium, Luxembourg, the Netherlands and Ireland have a chemical industry bigger than that of other EC countries. With regard to product segmentation, the German, French and Dutch industries are more concentrated on basic chemical substances and plastic materials, whilst the United Kingdom and Italy have a greater share of medicines and a few other everyday consumer products.

Research and development, and innovation

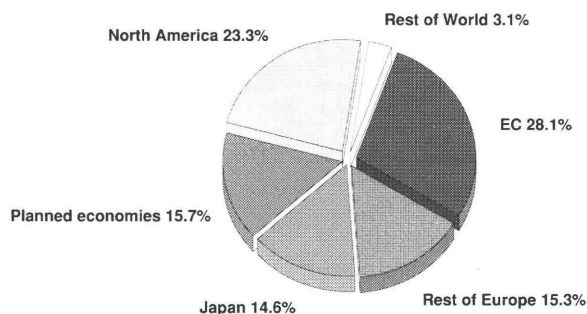
R&D expenditure has increased even in times of poor financial results. For 1987, the percentage of total turnover dedicated to R&D by the chemical industry was estimated at 4.5%, being 10.5 million ECU (CEFIC data). In specific sectors of the pharmaceutical and agro-chemical industry, this percentage can even go up to 10 - 12% of turnover.

R&D has opened up new fields. For the chemical industry the most innovative field is incontestably bio-technology: the application of scientific and engineering principles to the treatment of matter by biological agents.

As opposed to classical bio-technology, based initially on fermentation, modern bio-technology is an assembly of several technologies, of which the most important are:

- ❖ genetic technology, recombinant DNA technology, to isolate genes responsible

Figure 4
Chemical industry
World production, 1988



Source: CEFIC, DRI Europe

for certain properties of an organism;

- ❖ cell fusion, to unite the characteristics of different cell types within a single cell (for example, mono-clonal antibodies for treating illnesses);
- ❖ enzyme technology, to produce specific reactions;
- ❖ process technology, to develop and control the biological production process on a large scale. (Refer to R. Van Tulder and G. Junne: European multinationals in core technologies. J. Wiley & sons, 1988, page 12 onwards.)

The application of these new technologies will enable new product and new process development in the pharmaceutical industry, the agro-chemical industry, in the pesticide and refined chemical substance industry. It will represent a major contribution to improving personal safety and the environment (e.g. low waste technologies, low energy content technologies, clean technologies). Innovation is also apparent in a second category, that of new materials, advanced composite materials, polymers, plastics and ceramics. These materials have led to major innovations in the field of micro-electronics (silicon, gallium arsenide, optical fibres) and in the field of bio-technology (membranes).

Many small and medium-sized chemical companies have participated in projects within the Community framework programme in the field of technological research and development. This programme does not limit itself to offering financial support to the extent of 50% of research costs, but also combines research carried out in the various institutes and regions by opening new market opportunities.

For the chemical industry, the most important programmes are as follows:

Table 5
European chemical industry
Breakdown by country 1989

	Turnover (Billion ECU)	(as a %)
EC (*)	289 045	100.0%
Belgique/België, Luxembourg	21 303	7.4%
Danmark	3 230	1.1%
BR Deutschland	77 191	26.7%
España	29 553	10.2%
France	49 604	17.2%
Ireland	3 361	1.2%
Italia	40 148	13.9%
Nederland	20 342	7.0%
Portugal	4 221	1.5%
United Kingdom	40 092	13.9%

(*) excluding Greece
Source: CEFIC

1. BAP (Bio-technology action programme, revised 1988-1989) and BRIDGE (Bio-technology research for innovation, development and growth in Europe)
2. BRITE (Basic research in industrial technologies for Europe) and EURAM (Research programme on raw materials and advanced materials)

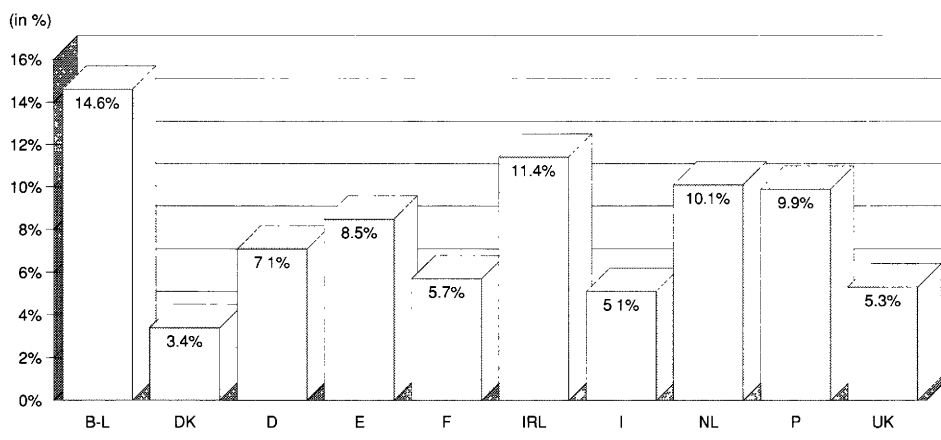
Commercial trends

Foreign trade holds a major place in the chemical sector. Export activity, i.e. the portion represented by exports in production, is 20%, or even 50% if intra-Community trade is included in the calculation. The Community is the world's leading exporter of chemical products, with exports

of more than twice those of North America. Traditionally the Community has a positive commercial balance (it is also, along with EFTA, the only large trading bloc showing a trade surplus).

According to CEFIC data, this surplus was 23.8 billion ECU in 1989. At that time, exports were 56.1 billion ECU. In 1986, following the fall of the dollar, the chemical trade surplus greatly deteriorated. It has, however, regained its growth since then, particularly from 1988 onwards. The sector remains one of the main trump cards of Community trade. In 1988, it represented 14% of manufactured goods exports from the EC, and a little less than 7% of its im-

Figure 5
Proportion of turnover in G.D.P., 1989



Source: Eurostat, DRI Europe



ports. Intra-Community trade has regularly increased since 1983. Exchanges between Member States were more than 80 billion ECU in 1989. Belgium, the Netherlands, Portugal and Ireland have the most active roles in the field of inter-Community trade. The Community's main commercial partners are EFTA, North America, the rest of the world (developing countries) and, to a lesser extent, the Pacific region (Japan, Australia and New Zealand). On their own, EFTA, North America and the rest of the world represent 73% of the Community's exports and 83% of its imports. It is with North America that the EC trade surplus has experienced the greatest growth since 1982. However, after 1985 this surplus decreased following the fall of the dollar. This degradation of the exchange rate encouraged EC chemists to undertake major investments in the United States during the second half of the 1980s. It should also be noted that the American and EC industry structures are somewhat different, to the extent that the American industry has not yet really experienced, like its Community equivalent, a movement in production towards refined chemicals. Thanks to the falling dollar,

American basic chemical competitiveness was noticeably improved between 1985 and 1989. Consequently, American companies did not experience the same incentives as their Community equivalents to develop downstream in sectors less sensitive to exchange rate movements. The phenomenon can also be explained by the presence in the United States of important resources for one of the primary raw materials of basic chemicals: oil. Regarding improvement in trade surpluses, South East Asia and the rest of the world represent fast-expanding markets. However, for a few years now, we have been witnessing the emergence of new basic chemical producers in these regions, especially in the oil-producing regions. Overall, Community exports are somewhat specialised in refined chemicals, whilst imports are of basic chemicals. To a certain extent, the EC imports basic chemicals in order to export refined chemicals. Competitive discipline created by imports is therefore higher for basic chemicals than for refined chemicals. Compared to the average EC trend, it appears that the Federal Republic of Germany and Denmark are more oriented towards Western Europe.

The United Kingdom and Ireland export more towards North America, whilst the proportion of exports towards developing countries is higher in France, Spain and Portugal than in the other EC countries.

Impact of the Gulf crisis

During the second half of 1990, the Gulf crisis created a dramatic increase in oil product prices. This increase caused the chemical industry to run greater risks than the majority of other manufacturing industries. This sector is in fact a big energy user. This usage is mainly upstream in the basic chemical industry. The biggest energy user is the petro-chemical industry, for which 100 ECU of production require between 35 - 40 ECU of energy (1985 prices). This consumption is the result of actual energy requirements as well as requirements for hydrocarbons as a raw material. Other sub-sectors with high energy contents are plastics (between 20 - 25%), inorganic chemicals and fertilisers (about 15% each one). If account is taken of hydrocarbon consumption as a raw material, between 85 - 90% of the chemical industry's total energy consumption is attributable to the basic chemical industry in its wider sense (i.e. including fertilisers

Table 6
Chemicals
Exports and imports
Annual growth rate - current ECU

	Total	EFTA	North America	Pacific Region	USSR	Eastern Europe	South-east Asia	Rest of world
EC exports								
1982-1988	7.79	9.31	12.55	11.71	7.23	3.34	12.81	3.87
1982-1986	7.99	10.29	15.62	11.76	8.2	4.18	13.06	2.32
1986-1988	7.4	7.37	6.65	11.6	5.31	1.68	12.3	7.04
1988-1989 (*)	8.4	8.75	5.55	8.14	32.83	2.53	10.16	8.19
EC imports								
1982-1988	8.52	11.5	4.47	13.42	4.18	5.11	25.09	8.26
1982-1986	9.21	12.55	6.08	13.18	4.56	6.23	24.04	7.34
1986-1988	7.14	9.43	1.32	13.91	3.42	2.91	27.23	10.11
1988-1989 (*)	12.86	13.1	20.83	15.36	-0.01	8.97	26.17	11.99

(*) 6 European countries
Source: DRI Europe

and plastics). Overall, the refined chemical industry is a low energy consumer but as the basic chemical industry is its main supplier, it is also likely to be indirectly affected by an increase in energy prices.

After the second oil crisis, the chemical industry has considerably improved its energy efficiency. This has increased by 29% between 1979 and 1985. It is, however, difficult to evaluate the additional energy savings that the sector could make to combat a further increase in crude oil prices. The International Energy Agency collected in 1987 the results of a series of technical surveys on potential energy savings within the industry. According to this research, potential energy savings within the chemical sector are, with the present state of technological knowledge, relatively limited. They are, in any event, a lot less than in sectors such as steel-making, paper production or construction materials. Therefore, the sectors most sensitive to variations in energy prices are organic chemicals, plastic chemicals, agro-chemicals and inorganic chemicals. The vulnerability of these sectors is also due to the intense competition which reigns therein, and which prevents companies from passing on entirely via their sales prices an increase in their costs. An increase in oil prices is therefore more likely to affect the profitability of these industries than that of refined chemicals.

Apart from its direct impact on energy costs and raw material costs, the Gulf crisis is likely to affect the chemical industry in two other ways;

- A slowing of the EC growth rate and therefore a slowing of demand for chemical products;
- Decreased competitiveness from EC chemi-

cal companies in relation to that of oil and natural gas producing countries; this loss of competitiveness is accentuated even more by the fall in the dollar over the last few months.

If the Gulf crisis had lasted some time, it would have meant a fall in production and a worsening of the trade balance in certain sensitive sectors such as petro-chemicals, the plastics industry or the fertiliser industry. The petro-chemical industry is, on this point, the most critical sector. In fact, it would have had at the same time to face up to a rise in energy prices, an even greater rise in raw material prices (the price of the latter, such as naphtha, increases generally more rapidly than the price of oil), as well as a decline in demand, which is particularly sensitive to industrial production changes. To this could be added a loss of competitiveness vis-a-vis companies operating in oil-producing countries. According to the EC experts' estimates, the joint factors of crude oil at \$30 per barrel and a slow-down in GNP growth could have led to a drop of 15% in petro-chemical industry production in 1991; a fall in exports by 9% and in imports by 5%. The oil crisis impact would have only been slightly weaker in the case of plastic production, with a fall of 12% in production; 8% in exports and 6% in imports. Finally, the fertiliser sector would have seen its production fall by 6%, its exports by 10% and its imports by 5%.

In fact, this sector has to confront, as do the other sensitive sectors, increased costs, falling competitiveness (in relation to producers such as North America or the Soviet Union), and a fall in domestic demand. But it will also suffer from a fall in demand from some of its main export mar-

kets such as China, India or South East Asia. The combination of the above-mentioned factors (price increases, fall in demand and loss of competitiveness) will most probably give rise to the reappearance of over-capacity, but will not have the same effects on all EC countries, mainly penalising those which have recently heavily invested in the sensitive sectors, such as Belgium, Portugal, Spain, Greece, German Federal Republic of Germany and France.

Environment

Environmental problems are particularly noteworthy in the case of the chemical industry. The latter, due to its size and the numerous pollution problems that it raises, is a favourite target for legislation, notably at EC level. However, the industry itself is very aware of the pollution problems of which it is directly or indirectly responsible and has already undertaken important efforts, often ahead of legislation. For 1989, expenditure is estimated at 2 billion ECU in the field of environmental protection.

The problems raised by the chemical industry with regard to the environment are in fact of two types; on the one hand, all the polluting elements caused by the production process itself, and on the other hand, the downstream pollution problems when the chemical products themselves are consumed. In the first area we find polluting emissions in air and water.

As an example, the sector, because it is a large energy user, is confronted with the problem of NOx (nitrous oxide) or SO₂ (sulphur dioxide) (gases responsible for acid rain) emissions into the atmosphere. As well as these two types of pollution, there is also the problem of waste processing and disposal. Opening new tips or extending existing tips runs into increasing

Table 7
German chemical industry expenditures on environmental protection, 1987

	Investment (Million of ECU)	(%)	Current expenditure (Million of ECU)	(%)
Total cost	499	100	2138	100
of which:				
Waste destruction	33	7	478	22
Water production	221	44	1083	51
Air protection	233	47	535	25
Noise reduction	12	2	42	2

Source: Verband der Chemischen Industrie

opposition from public opinion which perceives major nuisances (odour, damage to the countryside, etc.), as well as the risk of water and ground pollution.

For the moment, the investment expenditure aimed at combating various forms of pollution linked to production processes represents 10% of the sector's total investment, but it is expected that this percentage will double during the next decade.

Table 7 shows capital and current expenditure linked to environmental protection in the Federal Republic of Germany.

Current expenditure is far from negligible because it represents more than 3% of the industry turnover and is four times higher than the corresponding capital expenditure.

Pollution linked to using chemical products and not to their production can happen either at the time of actual use or at the time of disposal in the form of solid waste or during recycling. For the first example, we find volatile organic compound emissions linked to the use of solvents (in paints or adhesives), or water table contamination by nitrates in fertilisers.

Difficulties in recycling plastics or destroying the ozone layer with CFC's contained in refrigerators or air-conditioning systems are typical examples of the second form of pollution.

There are several types of solutions to the

environmental problems raised by the chemical industry:

- ❖ Use of clean technologies;
- ❖ Use of end-of-line technologies (filters, etc.);
- ❖ Substitute product development (HCFC instead of CFC).

Generally, a high proportion of the chemical industry research and development effort is geared towards environmental problems. This trend can only be increased in the future. Finally, it should be noted that amongst the industry sub-sectors, those situated downstream are more likely to be threatened by the appearance of substitute products which are kinder to the environment. In fact, it is mainly downstream (packaging plastics, notably) that substitute products can appear, coming from other industrial branches. On the other hand, the problems raised by intermediary goods produced and consumed by the chemical industry itself are generally likely to be solved by the appearance of new chemical products, sometimes more costly and generally more advanced from the point of view of their technological content.

1992

The main legislative measures by which the chemical industry hopes for rapid progress on the road to harmonisation cover the following areas; standards, bio-technol-

ogy, environment, energy, indirect taxation, fewer administrative constraints, transport de-regulation, R&D, competition, trade statistics and policies. Some progress has already been made in this direction but further efforts are necessary. As and when technical and administrative barriers to trade fall, we can expect that movements towards concentration and rationalisation will appear in the sector to maintain its competitiveness, exploit the possibilities of the larger market and benefit from economies of scale. This phenomenon will particularly affect the siting and the coordination of production, distribution, marketing and services. It should be noted that, according to the Cecchini report on the implications of creating a single market for the European economy, the chemical industry is one of the manufacturing sectors where the potential gains linked to the Single Market are the highest.

Outlook

Preliminary statistical data show a net slow-down in sector growth in 1990. Growth, slower than forecast, of EC economies has led to weaker demand for chemical products than that forecast by the majority of industry experts. To this weakening of demand is to be added the phenomenon of de-stocking and also an increase in the level of imports. The result is a very small increase in real chemical production in Europe, about 1.7%. Oil product prices during the second half of 1990, due to the Gulf crisis, have brought about a fall in profitability for chemical companies. The forecasts given in Table 8 are based on the hypothesis of stable oil. From this date EC chemical production will experience once again relatively high growth rates, of more than 3% on average per

annum. Such prospects are based on "a reasonable" evolution of environmental policies within the Community. A hardening of these policies, such as raising a tax on carbon to combat CO₂ emissions, could have a major impact on the results of various sub-sectors which comprise the whole chemical sector. On the other hand, forecasts for 1991 are far from being as optimistic. A slow-down in European economies following an oil price increase would lead to a new lowering of the growth rate for domestic demand. This lowering of demand will not be compensated by an increase in export trade to the extent that world trade will stand still. A lower rate of growth for imports will enable the industry,

Table 8
Chemicals
Main indicators, 1990-95
Constant prices - annual growth rates

(%)	1990	1991	1992	1993	1994	1995
Production	1.7	1.9	3.5	3.7	3.3	3.5
Consumption	2.5	2.0	4.2	3.8	3.5	3.7
Imports	6.6	4.4	7.1	6.6	6.5	6.0
Exports	4.2	4.0	5.3	6.3	5.8	5.7

Source: DRI Europe

however, to show real growth of about 2%. This low growth will not prevent industry profitability from falling, particularly within the basic chemical sector. In the medium to long-term, certain sectors should experience growth greater than the industry average, for example pharmaceutical products, cosmetics and perfume or plastics.

Written by: DRI Europe

The sector is represented at the EC level by:
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The Western European plastics manufacturing industry has experienced a spectacular turnaround over the last few years. It is presently in its seventh year of sustained consumer growth, most of which originates within the Community. Satisfying internal demand has taken over from export trade, leading to lower export trade levels in the industry. Investment in additional production capacity is planned with prudence because of the long-term uncertainties present in both the EC and the world economy.

Description of the sector

The plastics industry in its widest sense comprises of companies producing polymers and synthetic resins, mixed with additives to form materials known as plastics, as well as companies who transform these materials into semi- and fully- finished products. The EC plastics manufacturing industry, mainly composed of small and medium-sized companies, achieved a turnover of 55 billion ECU in 1988 and employed approximately 800,000 people. However the information and statistics listed below only cover plastic material manufacturing; plastic material transformation will be dealt with in a more detailed manner in Chapter 20.

Current situation

Western European plastics manufacturing production is estimated at 29 million tonnes in 1989, for a value of slightly more than 40 billion ECU. About 90% of the total is produced by the EC, the rest being spread among the Scandinavian countries, Austria and Switzerland. Generally, plastic materials and synthetic resins play an important role in the economy; the majority of industrial sectors and consumers

use plastic materials, either in the form of raw materials or as ancillary products.

Plastic material manufacturers are not only raw materials manufacturers; they also help the entire plastic product sector by contributing to the technical and commercial development of plastics applications. Overall, industrial and special plastics continue to enjoy healthy growth. Mass market plastics, which represent more than two thirds of total plastic production, have played a vital role in the plastics industry development since the Second World War. However, they have been hit by very large oil price rises and by the economic downturn during the period from 1975 to 1983, which led to production over-capacity. The mass market plastics industry has actively rationalised and restructured itself over the past years, notably between 1982 and 1984, adjusting production capacities and obtaining cost price reductions. The last six years have brought an upturn in demand and profits.

Industrial statistics for principal plastics collected by APME (Association of Plastics Manufacturers in Europe), cover all of

Table 1
Plastics
Main indicators, 1980-90 (1)

(thousand tonnes)	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990 ⁽²⁾
Apparent Consumption (2)	11 088	9 982	10 572	12 051	12 500	13 140	14 190	15 915	17 279	17 920	N/A
Net exports	1 174	1 407	1 005	1 594	1 651	1 141	900	720	547	216	N/A
Production	12 262	11 389	11 573	13 402	13 803	13 940	14 755	15 747	17 486	17 936	18 510
Employment (thousands)	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	170	N/A	N/A

(1) West European figures; 1989 provisional data; statistics cover LDPE, HDPE, PP, PS, PVC; PS does not include expandable grades nor acrylate or acrylonitrile modified grades

(2) 1980/81 figures are estimated

(*) Estimated

Source: APME

Western Europe. They do not give the detail of each member country's production.

Statistical data in this section cover production of the five main thermoplastics:

- ❖ low density polyethylene (LDPE);
- ❖ high density polyethylene (HDPE);
- ❖ polypropylene (PP);
- ❖ polystyrene (PS);
- ❖ polyvinyl chloride (PVC).

These thermoplastics represent about 66% of total plastic production in Western Europe - being a volume of 18 million tonnes with a market value of 20 billion ECU.

Western European production of these plastic materials is the equivalent in volume terms of the United States' production and more than double the Japanese production.

Consumption

The wide range of properties available and the tailoring of property profiles for specific applications have led to a vast and diversified demand for plastic materials. On the one hand, there are very high volume applications and on the other hand, technical applications characterised by continuous developments. A great number of industries use polymers at the same time as other raw materials.

The main outlets are found in the following industries: packaging, construction and civil engineering, transport, household equip-

ment, electricity and electronics, communication technology, textiles, agriculture and horticulture, games and leisure activities, health and medical applications, paper and wood, photography, armaments.

After the difficulties at the beginning of the 1980s, the plastic materials industry has benefited since 1984 from relatively sustained growth in demand, reflecting in part generally improved economic conditions in the Community or elsewhere. Quite recently, growth in two figures for certain plastic materials categories - with a record year in 1988 - is evidence of the high and sustained growth rates which the European plastics manufacturers are experiencing in terms of production and sales: total Western European plastics materials production has thus increased by 6.7% in 1987, 11% in 1988 and 2.6% in 1989. These exceptional growth rates may seem surprising in an industry which is generally considered to have reached maturity.

The sustained growth in demand for plastic materials is attributed to the improvement of the economic environment, and more especially to the favourable conditions prevailing in the end-user sectors such as the automobile and construction industries. Increased usage of plastic materials in the automobile industry, in the building industry, in food and drinks packaging, agricul-

ture, sewerage pipes and infrastructure development all contribute to increased consumption. Furthermore, it appears that plastic materials usage to replace other materials in industrial and household goods production is developing faster than forecast, and that consumption is reacting very quickly to the economic upturn.

Often, plastic materials replace traditional ones such as glass or steel, as they are lighter and energy-saving. The fall in their cost following the fall in oil prices since 1982 has further accentuated this product replacement. 1989 was marked, however, by a slowdown in demand, due to de-stocking by end-users after 1988. The growth in apparent consumption has thus gone from 8.6% in 1988 to 3.7% in 1989. The growth of true plastic usage has however been maintained in 1989.

In Western Europe, it is polypropylene - as in 1988 - which registered in 1989 the strongest growth with 13.8% by volume (versus 12.9% in 1988). This product usually surpasses the others as, the most recently created, it opens even more new markets. It is closely followed by low density linear polyethylene (11% growth by volume), a relatively recent product. Other thermoplastics remain stable although they all registered strong growth in 1988. These high growth rates, however, should not

mask the uncertainties which hang over the plastic materials industry in the long-term, whether it be in terms of legislative restrictions linked to the environment, changes in demand, or changes in production capacities.

Trade trends

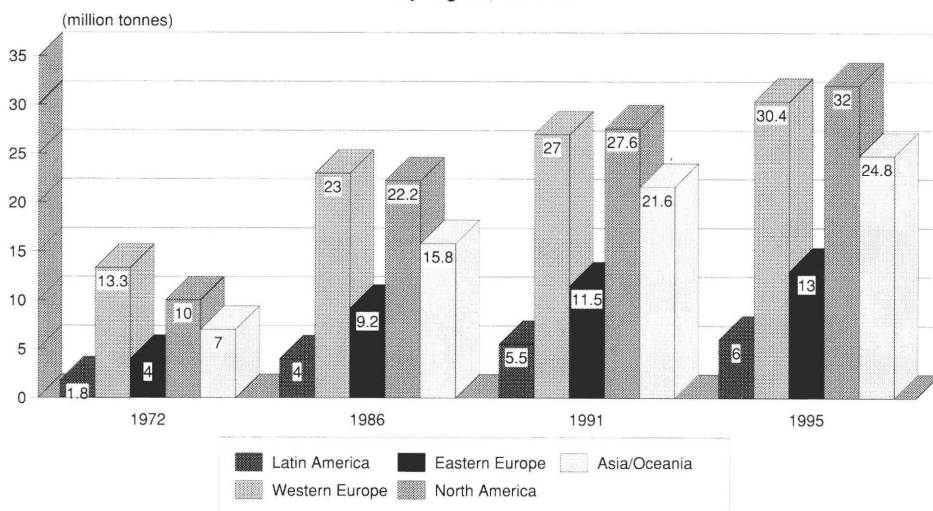
The Western European plastics industry exports about 8% by volume of its production. This export percentage fell during the period 1984-88; it was stable in 1989.

In 1984, 17% by volume of production was exported outside the Community.

By comparison, the United States' exports in 1989 represented 11% of the domestic production, whilst Japan exported 11.5% by volume of its production. Until recently, the highest growth in demand for plastic materials has come from inside the Community rather than from export markets. In volume terms, Western European exports have constantly declined since 1984; the 1989 level being 40% lower than that of 1984.

Western European imports have increased over the same period and at present represent 7% of the production.

Figure 1
World plastic consumption
by region, 1972-95



Source: Freedonia Group Inc

The growth of imports of the principal plastics was particularly strong in 1989 with a progression of 43%.

Over the last two years, exchange rate parities have in fact affected EC manufacturers' competitiveness and rendered the EC market more attractive for Middle and Far Eastern exporters.

However, the shortages within the EC have also encouraged increased import opportunities for the majority of products.

Employment

Over-capacity at the end of the 1970s and

the beginning of the 1980s led to major industry restructuring, particularly during the period 1982-4.

The rationalisation arising from this, which is still in progress in certain regions, signified a reduction in employment in the plastics industry down to the present figure estimated as 170,000. More recently, continued growth in demand and production has, however, created some jobs in the industry, but at a rather slow rate.

Investments

Plastic materials production restructuring

Table 2
Plastics
Production and external trade, 1980-90

(thousand tonnes)	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990(?)
Production											
EC (1)	12 262	11 389	11 573	13 402	13 803	13 940	14 755	15 747	17 486	17 936	18 510
Index	88	82	83	96	99	100	106	113	125	129	133
USA	11 038	11 642	11 078	13 042	13 584	14 285	15 296	16 784	17 982	17 602	N/A
Index	77	81	78	91	95	100	107	117	126	123	N/A
Japan	5 344	4 941	5 023	5 566	6 529	5 948	5 983	6 397	7 045	7 770	N/A
Index	90	83	84	94	110	100	101	108	118	131	N/A
Exports extra-W Eur	1 654	1 780	1 695	2 259	2 303	2 093	1 945	1 660	1 399	1 437	N/A
Index	79	85	81	108	110	100	93	79	67	69	N/A
Imports extra-W Eur	480	373	690	665	652	941	1 045	940	852	1 221	N/A
Index	51	40	73	71	69	100	111	100	91	130	N/A
X/M	3.45	4.77	2.46	3.4	3.53	2.22	1.86	1.77	1.64	1.18	N/A
Import penetration	N/A	N/A	0.07	0.06	0.05	0.07	0.07	0.06	0.05	0.07	N/A

(1) West European figures; 1989 provisional data; statistics cover LDPE, HDPE, PP, PS, PVC; PS does not include expandable grades nor acrylate or acrylonitrile modified grades

(?) Estimates
Source: APME

Table 4
Plastics
Forecasts

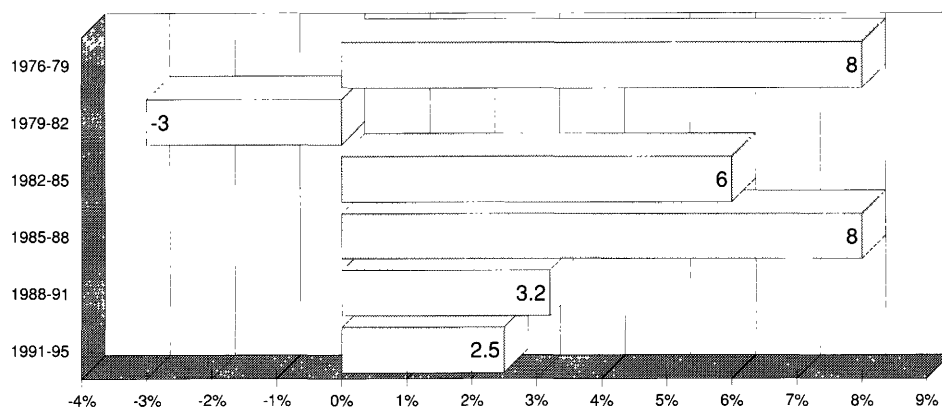
	1989	1990	1991	91/90 % var.	92/91 % var.	95/92 % var.
Production (thousand tonnes)	17 936	18 510	19 180	+3.6	+3.2	+3.2

Source: DRI Europe

and rationalisation has not been uniform all over the Community. Whilst thermoplastic capacities have been reduced in the

growth in demand has often brought about maximum usage of production capacity which, in turn, has favoured progressive re-

Figure 2
Western Europe plastic materials
demand evolution 1972-95



Source: Chem Systems International, Enimont

majority of Member States, the United Kingdom and the German Federal Republic have borne the major part of these reductions over the entire product range. Recovery in demand since 1984 has brought the industry up to new levels of production capacity usage. Continuing

covery of market prices. Thus, the companies' financial situation has much improved. Generally, plastic material manufacturers have funds available to invest in new activities. Factors determining investment seem to be linked more and more to the environment, notably in areas

covering the need to manage waste, and public acceptance of chemical products and chemical industry activities of which plastics are a part. Any further increase in production capacity will probably be cautious, taking account of the experience of the last decade; investment plans are mainly directed towards new process and new product development, as well as towards productivity improvements in order to maintain the industry's competitiveness. The European plastic material producing industry has a strong technological base. From the point of view of research and development, it compares favourably with American and Japanese industry. This is an important strategic trump card for a modern European industry which depends on the use of more and more sophisticated materials and technologies.

Legislative context

Legislation affecting public safety, environmental protection and well-being, is an important factor which influences industrial activities. The areas most concerned with safety are the following:

- ❖ the consequences of plastic contact in the case of medical or food applications;
- ❖ plastic safety with regard to fire;
- ❖ the ecological consequences of plastic

Table 3
Plastics
EC trade in current value

(million ECU)	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990(*)
Exports extra-EC	8 960.4	10 018.8	10 525.9	12 516.7	15 077.1	16 269.6	13 639.4	13 740.5	15 719.9	16 642.8	14 649.0
Index (')	55.1	61.5	64.7	76.9	92.7	100.0	80.4	81.0	92.6	98.1	90.0
Imports extra-EC	4 795.8	5 672.1	6 355.1	7 019.4	8 934.4	10 294.6	9 107.1	9 217.8	10 922.3	13 377.1	12 958.3
Index (')	47.0	55.1	61.7	68.2	86.8	100.0	82.1	83.1	98.4	120.6	125.8
X/M	1.9	1.8	1.7	1.8	1.7	1.6	1.5	1.5	1.4	1.2	1.1
Trade intra-EC	14 844.3	16 967.0	18 542.9	21 240.9	25 129.4	27 446.8	28 357.3	28 916.0	33 645.1	37 690.7	N/A
Index (')	54.8	61.8	67.6	77.4	91.6	100.0	103.7	98.3	114.4	128.2	N/A
Share of total (%)	59.3	59.8	63.7	62.9	62.8	62.6	70.0	68.3	70.9	73.5	N/A

(') Taking into account changes in EC membership.

(*) Estimates

Source: Eurostat (Comext)

usage.

These factors have an important influence on the industry's development. Recycling used plastic is developing as a contribution to communal management of solid waste, although this process still remains expensive if account is taken of the extra cost of waste sorting and the plastic recycling itself. However, certain EC countries have already introduced legislation setting goals to be achieved for the recycling of packaging products.

In traditional applications, plastics meet the same criteria as those applied to the materials they replace. In new applications, plastic alone, or combined with other materials, corresponds to much stricter output and safety standards.

Outlook

Uncertainty is driving the behaviour of the main internal markets and exchange rate movements continue, but the general prospects for the industry continue to be good. The first quarter of 1990 shows a return to the level of demand of the first quarter of 1989. Production growth in 1990 should be greater than that observed in 1989, with an expected rate of 3.2% versus 2.5% in 1989. In the medium and long-term, other factors will come into play. As

plastics are more and more used in all sectors of the economy, it can be expected that the plastic material industry will achieve results higher than the average of other industrial sectors. Generally, plastic materials production will continue to be a highly competitive sector; however, American investment in considerable production capacity and the increased rate of construction of factories in South East Asia bring fears of increased competition.

Faced with rising demand and thanks to increased profits from plastic material production, numerous companies have invested in new installations, which will come into service over the next few years.

According to Morgan Stanley's projections, between 1988 and 1992, world production capacity could increase by 24% and reach 16 million tonnes for polypropylene, by 17% and reach 10.3 million tonnes for polystyrene and 16% and reach 21.5 million tonnes for polyvinyl chloride.

But it is then expected that demand will slow as the growth phase of the cycle passes its highest point (refer to Figure 2 Chem Systems International). Therefore, the plastic materials industry could again be characterised by an over-capacity and mediocre profitability, as at the beginning

of the 1980s. The plastic material production growth rate should reach 3.6% in 1991, to fall back to 3.2% on average during the period 1992-95.

Faced with a growing market with a limited future and expected increases of plastic material imports, the EC must defend its advanced technological standards and reinforce in a selective way its research and development effort. Furthermore, the anticipated oil price rise in the middle of the 1990s will have consequences on cost structures.

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Revised by: DRI Europe

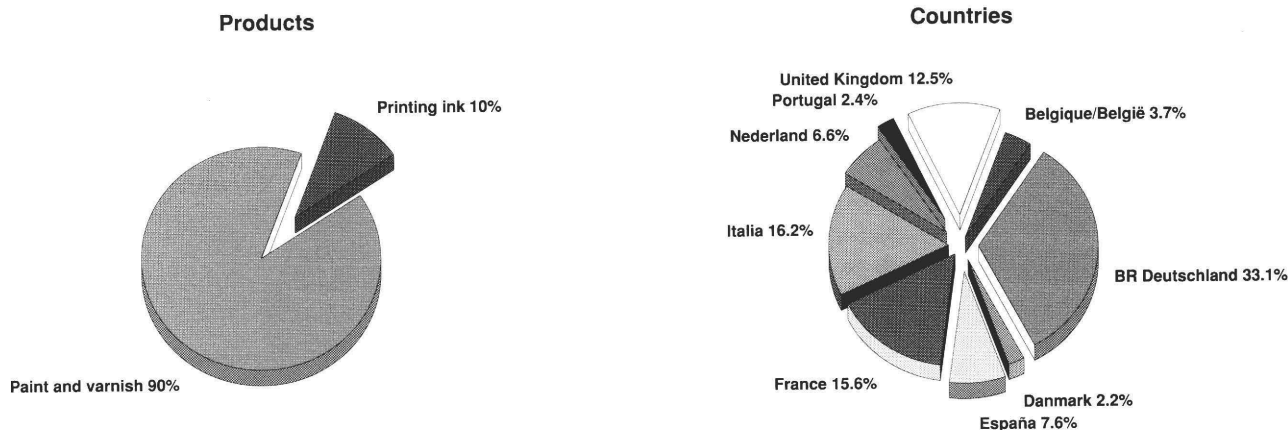
In 1989, aggregate production from the paint, varnish and printing ink industries stood at around 5 million tonnes, which represents a value of approximately ECU 12.4 thousand million. The development of production volume in the printing ink industries was less affected by the crisis of the 1980s than were the paint and varnish sectors. One factor that explains these different profiles is that paint production is more closely linked to industrial activity and to demand for durables and investment. In view of the costs incurred in transporting these types of goods, but also the structure of the industry (high concentration in the market for paint and varnish) and the importance of service linked to sales (repair work, rapid supplying to the ink industries), export levels are relatively low. Taking into account the relative stability of the market for paint, varnish and printing ink, and the prospects for overall growth in EC economies, an overall growth rate of the order of 3% can be expected in 1990, with more moderate growth over the following five years.

Description of sector

The NACE definition of this sector encompasses "paint, paint fillers, varnish and printing ink". The information and figures provided in this analysis relate in the first place to paint and varnish, with a separ-

ate section devoted to printing ink. The production of paint and varnish dominates this sector; it represents 90% of all volume produced and 84% of production value.

Figure 1
EC market structure for paint, varnish and printing ink
in the EC in 1989
(4.9 million tonnes)



Source: CEPE

Paint and varnish

The paint and varnish sector is characterised by goods which are intended for final consumption (to individuals and professionals) and intermediate goods supplied to industry (car, electrical, etc.). This sector therefore encompasses a full range of products with various applications, of which three main categories can be cited:

- ❖ architectural coatings, including exterior and interior house paint, primers, finishing coats, pore fillers, varnish and dyes;

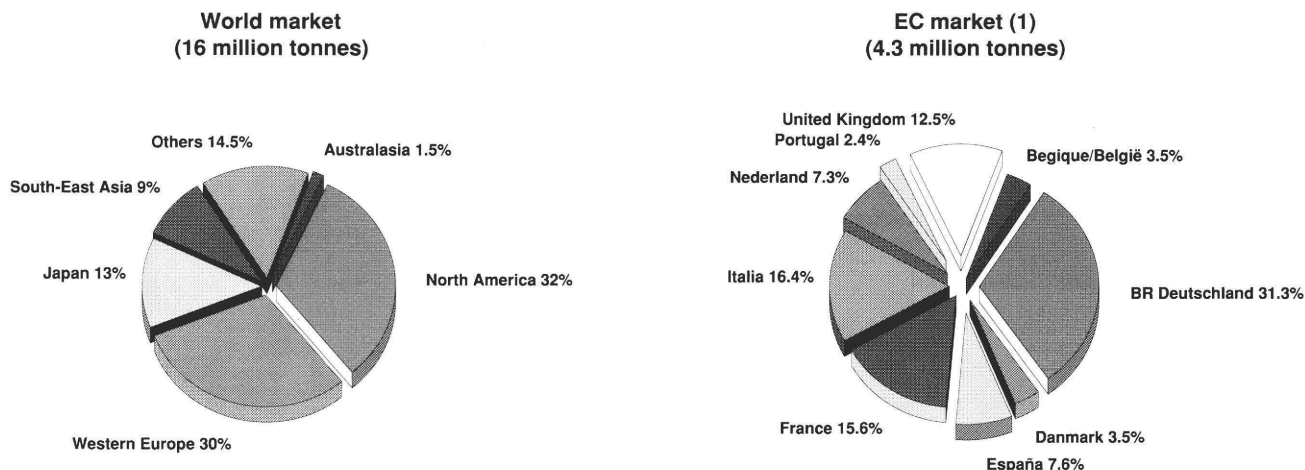
- ❖ product coatings used for a whole series of industrial products and consumer products; for example, for wood or metal furnishings, the car industry and other forms of transport, the aircraft industry, machinery and equipment, domestic appliances, electrical insulation, film, paper and foil, toys and sporting goods;
- ❖ special fillers designed for a specific application or for use in special conditions; these mainly include products for the repainting of cars and machines, high-performance maintenance, road markings,

bridge maintenance and also metallic coatings.

Current situation

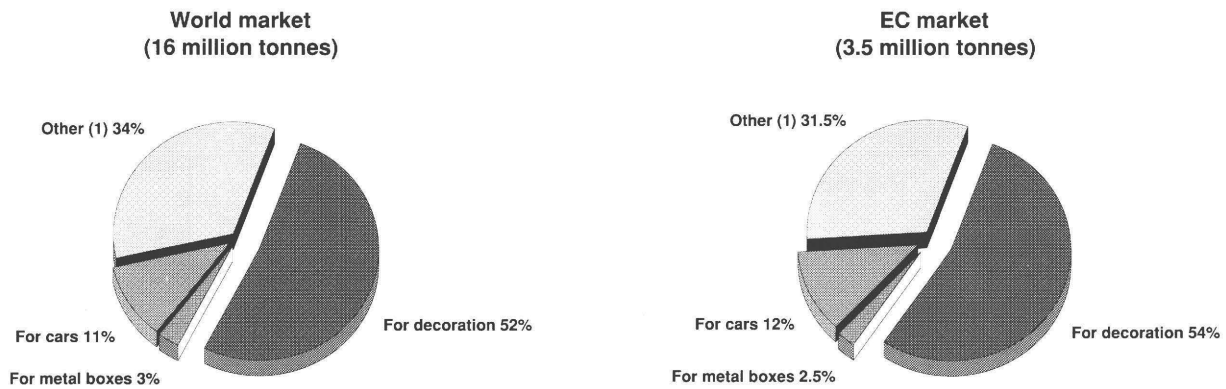
In 1989, production of paint and varnish in the EC reached approximately 4.4 million tonnes, representing over 80% of European production. In the world market, the industry in Europe represented 30% of the market, that is to say 2% less than North America. In the European Community, over 75% of production is accounted for by four countries: the Federal Republic of Germany (31.3% of EC production), Italy

Figure 2
Geographical structure of the paint market in 1988 (1)



(1) Not including Luxembourg, Ireland and Greece
 Sources: European Chemical News and CEPE

Figure 3
Per product structure of the paint market
in 1988



(1) Coatings intended for other industries
Source: European Chemical News

(16.4%), France (15.6%) and the United Kingdom (12.5%).

In terms of products on offer, both in Europe and the world market, paint for decoration predominates (54% of the market in Europe), followed by other paints (31.5%) which are intended for industries working outside the car industry; for example, powder coatings for the domestic appliances industry. In coatings for cars, a little over half is for OEM (Original Equipment Manufacture), while the remainder is for second application coatings.

Whilst production varies greatly, the level of consumption per inhabitant can also vary very strongly from one country to another. The highest level is to be found in Denmark (24.4 kg per inhabitant in 1988), with the lowest in Spain (8.7 kg).

Following the economic upturn in the Community, the production of paint and varnish has advanced since 1986 by around 5% a year. Given the range of products it offers, this industry's development actually depends, on the one hand, on private consumption, investments in building and renovation work by the various economic actors (individuals, firms, the State), and,

on the other hand, on the advances and technical and economic demands made by industries.

In this sector, the exported volume only represents a relatively small part of production (15% on average). Nevertheless, this rate varies greatly from one country to another. These low export levels can be explained by the relatively high costs of transport and the high concentration prevalent in this industry. Many firms in the sector actually own subsidiaries in various countries which allow them to serve local markets.

Production and consumption

Between 1981 and 1986, the production of paint and varnish within the Community fell by some 7%. It actually amounted to 4.2 million tonnes in 1981, a level which was only exceeded in 1988, following two years of strong growth. This development is in keeping with the economic upturn following the deep recession which characterised the beginning of the 1980s. This relative stabilising of the production volume was accompanied by new products and techniques of application which stemmed partly from rationalisation in the sector's

client industries and the problems of the environment.

"High solid" paint - products with a high concentration of pigments - and powder fillers (reducing the losses caused by overspray and allowing recycling) are noteworthy examples. Their use has increased (albeit slowly) and the use of high solid paint has become widespread. While powder coatings often attain rates of growth of over 10%, their share of total consumption is still relatively low probably under 5%. Proportionally greater demand has been recorded for high solid paint, signalling a reduction in the use of non-aqueous solvents. The solvents found in paint aid drying, and liquify the product. They are relatively expensive and pose

Table 1
Per capita consumption of paints

(kilogrammes)	1987	1988
Belgique/België	14.4	18
Danmark	26.3	24.4
BR Deutschland	19.5	19.6
España	8.2	8.7
France	13	12.7
Italia	12	12.6
Nederland	15.1	16.3
Portugal	10.3	10.4
United Kingdom	7.8	9.5

Source: CEPE

Table 2
Production of paint and varnishes (1)

	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990 ⁽³⁾
Volume (thousand tonnes)	4 182	4 239	4 178	4 025	4 048	3 928	3 889	4 075	4 430	4 438	4 571
Index ⁽²⁾	82.6	88.4	90.8	90.2	98	100	99	103.7	112.8	113	116.4
Current value (million ECU)	6 588	7 056	7 247	7 197	7 822	7 979	8 637	9 075	9 540	10 450	N/A
Index ⁽²⁾	106.5	107.9	106.4	102.5	103.1	100	99	103.7	119.6	131	N/A
Constant value (million ECU)	6 588	6 429	6 112	5 770	5 310	5 795	6 078	6 243	8 585	9 264	N/A
Index ⁽²⁾	113.7	110.9	105.5	99.6	91.6	100	104.9	107.7	148.1	160	N/A

(1) Excluding Greece, Ireland and Luxembourg
(2) Taking into account changes in EC membership
(3) Estimated
Source: CEPE

problems of pollution, which is why industries have reduced their content. Overall, technical standards are as good as, if not better than, those of non-Community competitors. No doubt this is due to the concentration within the market for paint and varnish and to the fact that several of the world's leading companies are from the EC. Apart from the fact that the range of "natural" products varies from one country to another, production has been hindered by a technical shortage of raw materials and a lack of technical staff.

The recent shortage and sharp rise in the price of titanium dioxide have been of crucial significance. This substance is at present easily the most used pigment, not only in white paint, but also to "lighten" most other shades. This technical shortage is continuing, although on a smaller scale. Certain specialists from the sector have even announced that the opening of new titanium dioxide production plants will at best merely stabilize prices for a while. Companies are also suffering increasingly from a lack of experienced technical staff, as a result of the mounting degree of "complexity" and the fall in the number of training facilities.

Protected / painted surfaces of all kinds continue to grow in number, while the continuation of the trend to manufacture more efficient paint - "high solids", powders - of-

fers the advantage of less bulky products containing fewer costly organic solvents. Nevertheless, the success of this new generation of ecological products continues to fall short of the predictions made for them.

Structure of industry

Aside from paint for the car and shipbuilding industries - owing to the particular characteristics of the consumer goods industry (linked to tastes, habits, etc.) - firms face no particular requirement to locate their production plants geographically. Even in these sectors, the need to maintain a presence the world over tends to lessen this characteristic. Although all the Member States of the Community have paint production plants, a considerable number of these are confined to within the major countries, chiefly the highly industrialised ones. The 1980s have been witness to a large number of mergers and downstream takeovers reaching well beyond national boundaries. In 1980, the ten biggest paint and varnish companies actually held 20% of the world market; by 1989, their share had risen to about one-third. Within the EC market, the leaders are: ICI (United Kingdom, the world's leading producer), BASF (FRG), PPG (USA), Hoechst (FRG) and Akzo (Netherlands).

Since 1980, over 200 acquisitions have been recorded, 30 of them in 1988.

Besides some product standardisation, the perspective of the Community Single Market is a significant inducement to concentrate production centres of the paint sector as it is for industry in the Community in general. Acquisitions in this sector also reflect the need to reach an adequate size to confront the concentration of distribution networks. In addition, greater centralisation of, on the one hand, spending on R & D - even more so now that the Directives on environmental protection have been adopted - and, on the other hand, spending on marketing are further factors to explain this consolidation. In 1989, for example, ICI's acquisition of Du Pont (powder coatings, USA) and the acquisition of Reliance Industries (USA) by Akzo could be noted.

Some segments of the paint industry can be viewed as oligopolies, such as lacquer and paint for the shipbuilding industry. Others are more diversified, notably decorative paint. In general, concentration is high in areas where production is highly specialised and demand relatively standardised. Car coatings for OEM and paint for metal boxes are actually segments with very high concentration.

The same is true from the buyers' side; the distribution system and client industries of the paint and varnish sector are becoming more and more concentrated. In

the case of the latter, car production is a striking example.

It follows that, in many countries, there appears to be a trend towards the formation of large companies with sizable means to finance chiefly R&D, or of small, specialised firms. Examples of family-run firms or medium-sized companies are not lacking. In the future, industrial concentration will intensify; many small firms which have ignored the potential and the consequences of the 1992 Single Market are destined to be wiped out, insofar as their local markets will no longer be able to preserve their existence. Otherwise, the wide variety of products and their multiple applications offer the flexible and innovative entrepreneur a great many opportunities.

The main consequences of this market concentration and globalisation to come will be:

A widening gap between world-wide groups and the small and medium-sized firms:

- on one side, huge R&D resources and advanced technology;
- on the other, a low level of production and a trend towards specialisation in consumer products.
- Fierce competition for relatively standardised products sold on domestic markets that are increasingly coveted by foreign companies.

External trade

In some cases, exports to relatively nearby countries may stimulate growth, although as a general rule, paint is a product which does not travel well, due to the relatively high transport costs involved. In countries with large production capacities, firms chiefly serve their domestic markets,

with export levels relatively low. Indeed, several Member States only export a small part of their production; the FRG (15% in 1989), France (12%), Italy (10%) and the United Kingdom (13% in 1988). Conversely, the paint and varnish industries in Belgium, Denmark and the Netherlands export a far greater share which varies between 40% in Belgium and 50% in the Netherlands.

The fact should be noted that the growing size of the main groups operating on a world scale, which specialise in fillers for a particular use and very often supply their clients locally, generate customer loyalty mainly by responding to their technical demands; the main international consumers are car OEM, packaging, metal boxes and domestic electrical appliances.

The internationalisation of the paint industry, the rationalisation carried out and trade in products between subsidiaries, mean that statistics on trade between Member States are becoming less and less accurate.

Employment

Employment in the industry rose by 9% in 1989, thus totalling 95.7 thousand people, or 10% fewer than the numbers in 1980 (106,400 jobs). This sizable reduction during the 1980s was due to rationalisation in this sector, mainly in terms of concentration, greater mass production, technological advances and the resultant specialisation.

Investment

The concentration of production units is set to continue in the future, entailing new investments. Investment necessary to protect the environment has also increased. While, in some countries, this has become compulsory by law or under public pressure, in others it has progressed more

slowly. The financial impact of environmental concerns has been put at 2.5% of turnover, which corresponds to the average profit rate. Research and development play an important role in most fields of application; the cost of this work demands that there is an international market and has led to higher concentration and greater specialisation.

Environment

The EC Commission has adopted several Directives on environmental pollution which concern the paint and varnish sector.

Titanium dioxide, or white oxide, is without doubt the product most affected in this industry. Paint, lacquer and ink represent around 55 to 65% of titanium dioxide consumption in the EC, the remainder being used in plastics, textiles and rubber.

In its natural state, titanium dioxide damages neither health nor the environment, although its refining is pollutive, either through the residues it creates, which are often dumped into the sea or into streams, rivers and waterways, or through the fumes which it gives off.

In 1978, a Commission Directive (78/176) was adopted with the aims of reducing pollution caused by waste and encouraging recycling. A second Directive was adopted in 1982 (82/883) to ensure extensive prevention and define procedures to control and monitor waste emissions into the environment, including the sea. In 1983, the Commission submitted a draft Directive to harmonise programmes to reduce pollution caused by titanium dioxide using industries. It set out to ban the dumping of the most pollutive residues and to limit liquid acid residues. In the absence of any consensus, this Directive has not yet been adopted.

Table 3
Employment and productivity in paint and varnishes

(thousands)	1980	1981	1982	1983 ^(*)	1984 ^(*)	1985	1986 ^(*)	1987	1988	1989
Employment ⁽¹⁾	106.4	103.7	98.1	93.6	90.9	88.8	88.1	89.1	88.0	95.7
Productivity	61.9	62.0	62.3	61.6	58.4	65.3	69.0	70.1	97.6	109.2

(¹) Excluding Greece, Ireland and Luxembourg

(²) Estimated

Source: CEPE

Forecasts

The concentration and globalisation of the market are being reflected in greater responsibility and increasing risks for producers. Moreover, the shortage of titanium dioxide and its high price, which will probably persist in the immediate future, are prolonging uncertainty.

The environmental protection regulations are also beginning to have tangible effects. In addition, with some raw materials reliant upon the price of crude oil, or derived directly from it (the industry in fact attributes half of its costs to this single factor), the change in the price of a barrel of oil is an element which can disrupt any increase in volume.

Taking account of these various elements and counting on moderate growth in the EC, all other factors being equal, the growth rate in the volume of production of paint and varnish in 1990 looks set to maintain the continuity of the previous year (around 3%), before returning to a level closer to the general trend in Europe over the period 1992-95 (1 to 2% a year).

Printing ink

Printing ink is used for a whole series of printing processes such as letterpressing, offset/litho, gravure, flexography, screen

printing and others, with the exception of textile printing. It is used to produce newspapers, periodicals, books, catalogues, advertising material, packaging, wall coverings, posters, business forms and official paper.

Current situation

Printing ink industry production in the EC has risen on average by 4% a year since 1980. This trend, which appears to have ignored the recession of the 1980s, can be explained chiefly by its lesser dependence on industrial activity, responding to the relatively stable activity of the food industry, for example. In addition, since the economic upturn began, some customer sectors have developed strongly (advertising, for example). In 1989, printing ink production reached 535,000 tonnes in 1989 (including Ireland), as against about 368,000 tonnes in 1980.

This level corresponds to virtually 90% of total production in Europe and has been assessed as being worth some 2 thousand million ECU.

Production and consumption

Within the European Community, the Federal Republic of Germany is the largest producer of printing ink; in 1989, it ac-

counted for 43% of production and employed 35% of the entire workforce employed in this sector.

The other main national producers of ink in the Community are the United Kingdom (14% of production and 20% of employment), Italy (14 and 11% respectively) and France (13 and 16%). The Federal Republic of Germany is also the largest consumer of ink per inhabitant (2.7 kg in 1989), followed by Belgium (2.4 kg) and Denmark (2.0 kg). In spite of the decline in book printing, the use of the letterpress process has not entirely disappeared, even though it is at present at an extremely low level. Otherwise, offset printing continues to grow in importance.

Packaging, chiefly of food, remains an interesting market and is increasingly becoming the business of specialists, subjected to legislation which can still differ slightly depending on the country concerned.

The long-awaited negative effect of electronic media (radio, television) on newspapers has now begun to manifest itself, albeit on a smaller scale than had been expected.

From the environmental protection point of view, the use of non-aqueous solvents may pose problems similar to those encountered by the paint industry, even if the rather limited number of professional users means that emissions can be controlled more effectively.

Structure of the industry

Unlike the paint sector, there are only a

Table 4
Forecasts for paint and varnishes

	1989	1990	1991	1991/90 var %	1995/92 var %
Volume of production (1000 tonnes)	4 438	4 571	4 663	2	1.5

Source: DRI Europe

Table 5
Printing ink sales

	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989
Value (million ECU) ⁽¹⁾	962.9	1 022.2	1 100.6	1 173.8	1 306.2	1 430.8	1 499.3	1 582.2	1 757.0	1 950.2
Quantity (thousand tonnes) ⁽²⁾	367.9	366.8	368.9	381.2	405.1	413.4	430.8	451.4	494.6	535.3

⁽¹⁾ Excluding Greece, Ireland and Luxembourg; 1986 also excluding Portugal

⁽²⁾ Excluding Greece and Luxembourg; 1985-86 also excluding Ireland; Production figures (not sales) for Ireland for other years

Source: CEPE

limited number of multinational firms in the printing ink industry. Nevertheless, a series of mergers, following the same pattern as the paint industry, was carried out in this sector in the 1980s.

Generally speaking, production units in most southern EC countries are considerably smaller (family-run firms) than in other regions of the Community.

Another interesting development seen in a number of countries, albeit at a relatively slow rate, is the growing size of printing works controlled by the State or other public bodies.

Other points in common with the paint industry are, on the one hand, the costs of transporting ink and, on the other, the dependence of raw material costs on the price of oil.

It should also be pointed out that the financial reserves of a fair number of companies can be considered to be below the

norm.

Employment

Although employment in the printing ink industry fell in the 1980s, it has remained stable for some years at around 13,000 jobs spread across over 140 firms. The technological advances requiring fewer workers and the regrouping which has taken place are an intrinsic part of this phenomenon.

External trade

The share of production exported amounts to 20% on average for the whole of the Community, a rate which is relatively low when compared to the average for European industries. As in the paint and varnish industry, this rate exceeds 40% in Belgium and the Netherlands. The low average level, which is representative of the dominant producers within the Community, can be explained in part by the importance of the service that comes with the product,

that is to say repair work, rapid delivery, etc.

The biggest share of production is therefore consumed internally, particularly in the main producing countries (the Federal Republic of Germany, France, the United Kingdom). For smaller-size producers, trade between Member States is greater. Export levels are much lower still in Japan (3 to 4% of production).

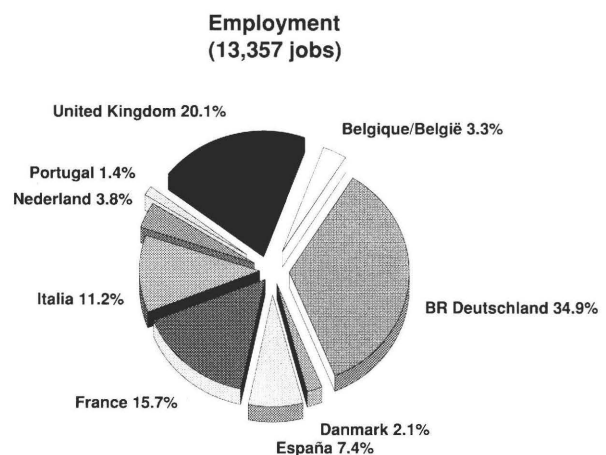
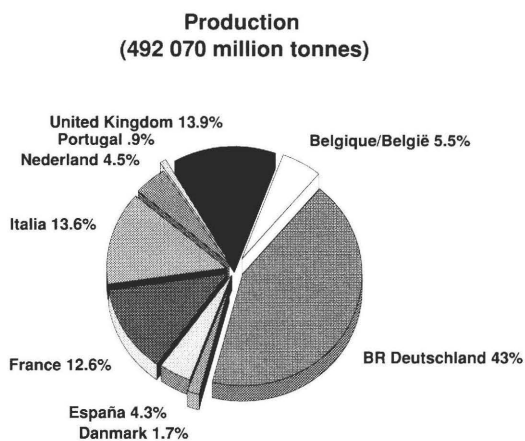
Investments

Investments are limited to rationalisation and modernisation programmes carried out mainly for ecological reasons. Obligations in this regard seem to vary considerably from one country to the next.

As with the paint industry, there are hardly any major barriers to trade to be removed between now and "1992".

However, the predominant role of service in this sector will require each individual to make a special effort to preserve his posi-

Figure 4
Geographical structure of the printing ink industry in the EC (1) in 1989



(1) Not including Luxembourg, Ireland and Greece
Source: CEPE

tion within the multicultural and multinational markets.

Outlook

The outlook for the printing ink industry depends on the development of activity by its users, chiefly in newspaper circulations, but also in printing quality (European standards on printing ink are among the toughest in the world). No figures exist to allow a breakdown of types of use. However, as current development is showing, the future of the graphic industry does not seem to face any fundamental threat from the electronic media.

By reckoning on a stable, general economic growth rate within the EC, and in view of the trend of the past few years, it is estimated that growth rates could be of the order of 5% by volume in 1990, before falling back to an annual rate nearer to 2% in the medium term.

Written by: DRI Europe

The industry is represented at EC level by:

CEPE: European Committee of Paint, Printing Ink and Artists' Colours Manufacturers' Associations

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Table 6
Per capita consumption of printing inks

(kilogrammes)	1986	1987	1988	1989
Belgique/België	1.6	2.1	2.3	2.4
Danmark	1.9	2	2	2
BR Deutschland	2.4	2.5	2.6	2.7
España	0.5	0.5	0.6	0.6
France	1.2	1	1	1.3
Ireland (*)	0.7	N/A	N/A	N/D
Italia	0.8	N/A	N/A	1.1
Nederland	1.6	N/A	N/A	1.7
United Kingdom	1.4	1.1	1.4	1.4

(*) 1985

Table 7
Forecasts for printing ink

	1989	1990	1991	1991/90 var %	1995/92 var %
Volume of production (1000 tonnes)	535.3	562.1	578.9	3	2

Source: DRI Europe

The quality and the value of all types of glue currently produced are very low, including their share of value added during the production process.

Today, glues are used in nearly every manufacturing industry, and privately in households.

The glue production in the EC in 1989 had a market value of approximately 3.4 billion ECU.

The new glue mixtures that are manufactured gradually replace the use of screws and moulding, leading not only to an increase in glue production, but also to a rise in goods constructed using glue.

Description of the sector

It was not until after the Second World War, especially the last 30 years, that the glue industry has become an important business. The development is due to the usage of new raw materials as well as new production techniques.

There are two types of glue:

- ❖ Liquid glues, which consist of a glue-based material liquified with a solvent, which evaporates after the two surfaces have been glued together;
- ❖ Solid glues, which have to be "activated" before they can be used. The "activation" can be made by either a solvent, water, heat or simply by reaction with air.

Types of glue produced depend on the following items:

- ❖ the type of materials that have to be glued (e.g. metal to metal or metal to wood);
- ❖ the incorporation of the glueing process into the different steps of production (e.g. during the production of a car, 12 kg of glue are used, but at very different places, engine, carpet, sealing, etc);

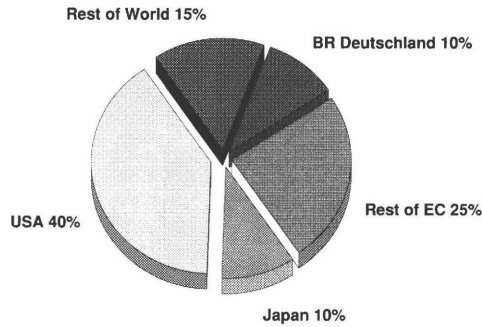
- ❖ the speed with which the glue has to dry (e.g. glueing cigarettes - 8000 connections of filters and cigarettes per minute);
- ❖ the type of pressure to which the connection is exposed (e.g. major sustaining parts of a building, books, heat, cold and humidity);
- ❖ the desired adhesive strength (e.g. easily removable parts or only removable by destroying the surface).

The classic raw materials contained in glues are animal materials (bones, skins, etc), different sorts of saps, casein, natural and synthetic rubber, as well as different synthetic products from the chemical industry (i.e. polyvinylacetate, polychlorophene, polyurethane, silicon, acrylic, etc).

Due to chemical research, organic solvents are being increasingly replaced by water, without losing properties of adhesion.

Production and usage rate In the EC about 500 companies produce glue. These are mostly medium-sized firms with an annual turnover of between 2.4 and 14.5 million ECU. But there are also big multina-

Figure 1
Adhesive world market sales, 1989
(10 billion ECU)



Source: FEICA

tional companies in the EC producing glues, such as Beiersdorf, Borden, Bostik, Casco, Cecu, 3M, H B Fuller, Grace, Henkel, Loc-tite, National Starch and Swift.

Precise statistics concerning the production of glues do not exist. Nevertheless the most accurate estimates show a worldwide production of glue worth around 10 billion ECU per year. Of the total production, 40% is produced in the USA, 35% in EC, 10% in Japan and 15% in the rest of the world. In the EC, West-Germany is the largest glue manufacturer with an annual production of around 450,000 tonnes worth around 1 billion ECU. This amount represents about a quarter of the entire EC glue production.

Most of the glue manufacturers have specialised their production according to the types of glue they offer and the customers they serve. According to specialists the whole production is split into four main customer groups, of which each group uses approximately one quarter of the output. The industries' four groups are the construction industry, the furniture industry, the paper and packaging industry and miscellaneous which include the automotive, electronic, shoe and cigarette industries and private households.

Estimates claim that around 57% of the total glue production is used in the industrial sector; 43% in the end-user sector, of which 27% in the do-it-yourself area and 16% in the hand-craft sector.

Some companies, especially the big multinationals, offer an extensive range of different types of glue.

Trends

Since the adhesive industry offers the newly developed and highly specialised metal and plastic glues, not only the common methods of connecting like nailing, screwing and welding are being replaced more and more by adhesives, but a possible connection with glue has increasingly become part or even the starting point of technical innovation. Glueing allows the usage of thinner and lighter materials, which in turn permits the construction of "faster" end products (e.g. cars and aeroplanes).

The main target of research and development in the glue industry is therefore to enhance the old types of glue by improving their chemical composition. The new improved glues then facilitate the gaining of new markets. In order to achieve this goal, the standardisation types of glue, is essential.

The accomplishment of a Common European Market in 1993 will level out regional differences and the European adhesive industry will be able to look forward to a solid economic growth with higher application rates of glue, especially in the industries of the future like avionics and electronics.

An obstacle to future growth will be the move towards stricter environmental laws of product safety and quality. It is expected that the growth of the glue industry will differ according to the sector, but generally speaking, an annual growth rate of 2-3% in the coming years seems to be a realistic estimate.

FEICA: Fédération Européenne des Industries de Colles et Adhésifs.

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Reviewed by: ERA: European Research Associates

While production remained relatively stable during the Eighties, the fertilizer industry underwent restructuring and rationalisation on a large scale with a view to increasing efficiency and revitalising competitiveness. The sector is particularly sensitive to fluctuations in world supply and demand and to competition in general; between 1980 and 1989 the volume of imports into the Community almost doubled while visible consumption within the Community rose by just 25%. Exports fell sharply during the same period. The early Nineties will probably be marked by a drop in Community demand and the persistence of over-capacities, a situation that will further accelerate the ongoing process of restructuring.

Description of the sector

The fertilizer industry produces and markets single fertilizers such as nitrogen (N), extracted from the atmosphere, or phosphate (P), obtained from imported minerals, as well as a range of complex fertilizers containing compounds of N, P and K (potassium).

The latter element comes from deposits located either within the EC or in third countries. Nitrogen, phosphate and potassium are the essential elements of plants. Some intermediate products obtained during the manufacture of fertilizers (ammonia for example) are also used in other sectors of chemistry.

The statistical data of this chapter relate to fertilizers proper; the intermediate products will be dealt with in the section on chemistry.

Current situation

In 1989 the fertilizer industry of the EC produced around 50 million tonnes of fertilizer including products for technical applications and semi-finished products to a value estimated at 6.6 billion ECU (6.7 billion ECU in 1988). These 50 million tonnes of fertilizer include approximately 19 million tonnes of fertilizing elements. The industry in the Community accounts for 12% of world fertilizer production (15% in 1988) and is the fourth world producer after the Soviet Union, the United States and China. After a sharp decline in the early Eighties production stabilised from 1986 at around 50 million tonnes.

Consumption

The consumption of fertilizer is seasonal and geographically scattered; of the 50 million tonnes, 30 million are used in three months over the whole agricultural territory

Table 1
Fertilisers
Main Indicators, 1980-89

(million ECU)	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989
Apparent consumption (1)	5 700.0	6 100.0	6 600.0	6 500.0	7 200.0	8 100.0	7 900.0	7 000.0	7 200.0	7 300.0
Net exports (1)	133.0	241.0	- 67.0	- 141.0	98.0	42.0	- 344.0	- 510.0	- 450.0	- 732.0
Production (1)	5 800.0	6 300.0	6 500.0	6 400.0	7 300.0	8 100.0	7 600.0	6 500.0	6 700.0	6 600.0
Employment (thousands) (2)	N/A	N/A	N/A	N/A	60.0	N/A	N/A	50.0	50.0	45.0

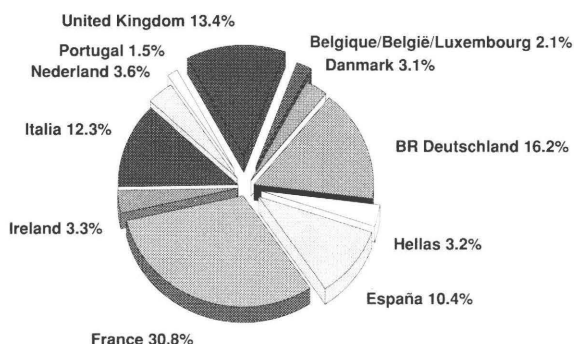
(1) 1980-85 EC10. Manufactures made from imported semi-finished products are not included in Community production.
(2) Direct employment excluding maintenance and distribution
Source: CMC-Engrais

Table 2
Fertilisers
Production in volume and in current value (1)

	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989
Production (million ECU)	5 800.0	6 300.0	6 500.0	6 400.0	7 300.0	8 100.0	7 600.0	6 500.0	6 700.0	6 600.0
Production (million tonnes)	46.0	44.0	42.0	42.0	45.0	45.0	49.0	50.0	51.0	50.0
Unit price index	126.1	143.2	154.8	152.4	162.2	180.0	155.1	130.0	131.4	132.0

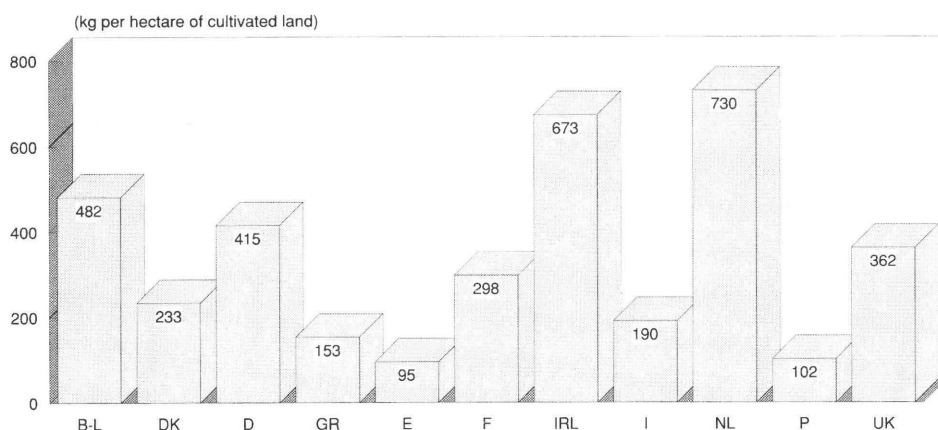
(1) 1980-85 EC10. Manufactures made from imported semi-finished products are not included in Community production.
Source: CMC-Engrais

Figure 1
Consumption of mineral fertilizers in the EC, 1988
Total: 18 million tonnes (nutritive elements)



Source: OECD

Figure 2
Fertilisers. Annual usage of fertilizers in the EC, 1987
(kg per hectare of cultivated land)



Source: FAO, OECD

of the Community. Since fertilizers are continuously manufactured products their distribution is ensured throughout the year by means of a substantial transport and storage infrastructure. The storage costs are covered by staggering prices down the agricultural year; prices are at their lowest level at the beginning of the non-growth season and rise as the period of use approaches. Consumption increased by 2.5% on average during the Eighties but a growing proportion of Community consumption has come from imports: their share went up from 10% of total Community consumption in 1980 to 16% in 1989. Today EC consumption is going through a spell of stagnation and actually looks set to fall during coming years.

Foreign trade

In 1989 this sector exported approximately 8% of its total production (10% in 1988). The balance of foreign trade which was in surplus at the beginning of the Eighties has fallen into deficit since 1986. The Community industry is exposed to competition from developing countries who enjoy exten-

Table 3
Fertilisers
EC Trade in current value

(million ECU)	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989
Exports extra-EC (1)	739.0	860.0	603.0	685.0	991.0	1 066.0	690.0	669.0	579.0	466.0
Index (2)	70.0	81.0	57.0	65.0	94.0	100.0	62.0	60.0	54.0	44.0
Imports extra-EC (1)	606.0	613.0	670.0	826.0	893.0	1 024.0	1 034.0	1 040.0	1 029.0	1 198.0
Index (2)	60.0	60.0	66.0	81.0	88.0	100.0	100.0	101.0	100.0	117.0
X/M (2)	1.2	1.4	.9	.8	1.1	1.0	.7	.5	.6	.4
Trade intra-EC (1)	939.0	1 060.0	1 383.0	1 531.0	1 774.0	1 881.0	1 724.0	1 644.0	1 654.0	1 860.0
Index (2)	49.0	56.0	74.0	82.0	95.0	100.0	91.0	86.0	88.0	99.0

(1) Reporting countries- 1980-85 EC10, 1989 Greece estimated. Extra-EC is taken to be extra-EC12

(2) Taking into account changes in EC membership

Source: CMC-Engrais, Eurostat (Comext)

sive reserves of natural gas and phosphate and to competition from planned economies eager for foreign exchange. This competition is particularly keen when supply exceeds demand on the world market as was the case in 1986 and 1987 when most European producers were unable to break even. In 1989 the trade deficit in fertilizers in the EC was 732 million ECU compared to 450 million in 1988. In response to the dumping practised by certain exporters and the damage caused by cheap imports, the authorities of the Community as well as other OECD states have introduced anti-dumping measures.

Characteristics of the main structural and geographic factors

The fertilizer industry is largely dependent on raw material resources: hydrocarbons

(especially natural gas) and natural phosphates; these products are bulky and of low added value. It is also a highly capital intensive sector where the construction of an ammonia plant producing 500 000 tonnes per annum costs around 250 million ECU and the pre-processing plants upstream of it can cost double that amount. The fertilizer factories are often vast integrated production platforms also manufacturing intermediate products for other sectors of industry. These products include ammonia, nitric acid, urea, ammonium nitrate, sulphuric acid and phosphoric acid. Setting aside the sale of these intermediate products which represent only 10 to 20% of total production, the industry has but one source of revenue; farmers. The Community industry is committed to a huge restructuring and rationalization process

both within national frontiers and at Community level. Sales networks have been developed in all countries. Plants have been shut down and production concentrated at the most favourable locations in terms of supply and outlets. The necessary investments have been made in order to improve efficiency and productivity - especially in the use of energy - to produce the best fertilizers and distribute them in the most effective way.

Six companies occupy a commanding position in Europe; Norsk Hydro (Norway), Kemira Oy (Finland), BASF (F.R.G.), Grande Paroisse (France), Enimont (Italy), FESA (Spain).

Research and development

In terms of research, the industry looks at methods of fertilizer application that en-

Table 4
Fertilisers
EC Trade in volume

(million tonnes)	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989
Exports extra-EC (1)	6.7	5.6	4.1	5.0	5.8	5.9	5.1	6.0	5.0	3.8
Index (2)	116.0	97.0	71.0	86.0	100.0	100.0	84.0	98.0	84.0	64.0
Imports extra-EC (1)	4.4	3.8	4.1	5.0	4.9	5.4	7.1	8.6	7.5	8.4
Index (2)	82.0	71.0	75.0	93.0	91.0	100.0	129.0	156.0	140.0	155.0
Trade intra-EC (1)	8.1	8.1	9.8	11.0	12.0	11.5	12.2	14.0	13.7	15.0
Index (2)	71.0	70.0	85.0	95.0	103.0	100.0	105.0	121.0	119.0	130.0
X/M (2)	1.5	1.5	1.0	1.0	1.2	1.1	0.7	0.7	0.7	0.5

(1) Reporting countries- 1980-85 EC10, 1989 Greece estimated. Extra-EC is taken to be extra-EC12

(2) Taking into account changes in EC membership

Source: CMC-Engrais, Eurostat (Comext)

sure usage is more efficient and environmentally friendly.

The aim of this research is to identify the periods of use, the methods of spreading and the best agricultural practices, the objective being to optimise the use of fertilizer while protecting and respecting the environment at the same time.

Research is often done in conjunction with private and public agricultural institutions, and the publication of results forms part of the education traditionally offered by the industry.

Environment

The chemical origin of fertilizers coupled with the fact that they are spread on the majority of cultivated land raises questions as to their effects on the environment and the food chain. The presence of nitrates in water and of cadmium in the soil are matters of particular concern. Regarding nitrates, the latest ECETOC report (European Centre of the Chemical Industry for the Environment and Toxicology) has raised doubts as to the validity of the data on which the current limit imposed by the EC is based: 50 mg of nitrate/litre for drinking water. Concerning cadmium, there is very little data available on the link between the cadmium content of the soil and that of vegetation or between that of vegetation and that of food on the one hand, and between the amount of cadmium absorbed and human health on the other.

This phenomenon involves very complex processes in the biotope (soil, vegetation, animals, humans).

Fertilizers supply the plants with the nutritional elements they need.

Spread in the right amount at the right time, they cover the plant's nutritive needs

and are absorbed almost completely. Most nitrates in water result from the mineralization of organic matter in the crop systems during the period from August to October and from manure used in cultivation.

Although the nitrate levels currently recorded do not constitute a health hazard, the fertilizer industry is committed to preventing their increase and reducing them whenever possible. Phosphate fertilizer may contain cadmium as a result of impurities in the untreated phosphate used as the raw material.

There is at present no known industrial process for eliminating those impurities, and even though the quantities involved are minimal (2.5 g/ha/yr in the EC) the fertilizer industry is doing all it can to limit them still further.

Research programmes including some funded by the Commission are aimed at identifying solutions applicable to the conditions encountered in the countries that produce raw phosphates.

Outlook

The increased use of fertilizers is essential to help increase food production and improve food quality so as to cope better with the growth in world population.

Trends in fertilizer production will however probably be irregular due to a number of economic and climatic factors.

Certain political factors are also important, in particular the common agricultural policy and policies on the environment and trade, since it is an industry which is very sensitive to the price of imports.

As a result a cyclical imbalance between supply and demand will persist and market prices will continue to experience extensive fluctuations.

The economic crisis which the EC fertilizer

industry is currently going through is due to a slump in demand and a sharp rise in imports. In future it is to be expected that penetration by imports into the EC will continue and might even deepen if trade exchanges are liberalised.

The outlook for trends in the demand for fertilizers in the Nineties scarcely seems more optimistic. According to certain estimates the demand for nitrogen fertilizers which represent more than half fertilizer production will decline in Western Europe by 1.5% per annum to 1993, after already falling by 1% in 1988 and 1989.

The United Kingdom, Denmark and the Netherlands will be most affected by this reduced demand with a drop of 10% compared with 1986-87, and a drop of 10 to 20% is forecast by the mid Nineties.

Only Greece and Portugal should enjoy a growth in demand. Legislation which is currently proposed at both national and European levels to restrict the concentration of nitrates in soil and water could aggravate this tendency; Norway for instance is set to impose a 50% reduction in the use of nitrogen fertilizers on land which drains directly into the North Sea. World demand should nevertheless grow overall by 2 to 3% per annum.

This divergence between supply and demand has brought about a situation of overproduction and price collapse in Europe. We are also witnessing the advancing rationalisation of operations - not to say a gradual disinvestment - on the part of some major European industrial concerns. ICI, BASF and Norsk Hydro closed a number of plants in 1989 while the Fesa-Enfersa merger in Spain resulted in the progressive closure of six production units. Hoechst will also cease the production of

fertilizer in 1990. The fertilizer industry in the Community has undergone considerable changes during recent years. Current endeavours to cut production costs and stimulate productivity will be continued however; future competitiveness will depend on the cost of raw materials - particularly natural gas - and the constraints imposed on the industry in terms of plant operations. An enhanced understanding of plant species and their needs will bring about an improved utilisation of fertilizers and will probably bring about a gradual decline in fertilizer consumption and lead to

keener competition among producers. The reliability of fertilizers supplied to farmers is one of the major responsibilities of the manufacturers of the EC. A significant reduction in the market share of the industry best suited to respond to the agricultural and environmental constraints of the Community could have serious consequences.

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Updated by: DRI Europe

With 29% of the market share, the EC remains the world leader in the agrochemical market. The USA, with nearly 24% is the world's second largest agrochemical market. Globally the agrochemical market is forecast to grow at an average annual rate of 2.9% until the mid nineties.

Previous forecasts indicated that growth would be lower on average within Europe, however more recent statistics indicate otherwise. Average market growth in the EC during 1988 was approximately 6%. It can be expected therefore that the EC will not only retain its present level of market share but actually increase its lead position in the future.

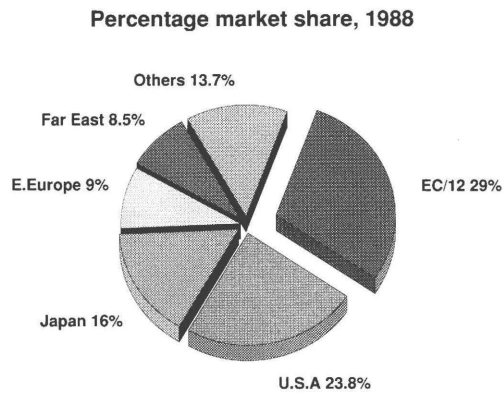
The EC maintains a favourable balance in world agrochemical trade with exports almost three times imports. Intra-Community trade continues to increase as trade barriers are removed in preparation for the single European market. Growth is forecast in exports driven by a continuing increase in demand from the developing nations.

Biotechnology has recently become a key area of research with plant breeding and biopesticide research dominating biotechnical developments. The new products will be safer for the environment and provide stronger pest control. However, the first commercial results of this research are not expected to appear on the European market before 2000. One of the major challenges faced by the industry in the Community, harmonisation of product registration, is still under debate. A common procedure concerning active ingredients on

a Community level, and specific national procedures for formulated products has been proposed, but it is not expected that there will be a formal policy in place before 1992.

A more competitive environment is expected with the advent of the single European market and there will probably be fewer agrochemical companies in the EC by the mid nineties. Prices will converge towards the French level which is the middle of the price range and further consolidation of the industry is expected.

Figure 1
World agrochemical market



Source: County NatWest WoodMac

Description of the sector

The agrochemical industry is relatively small compared with other sectors of the chemical industry. Highly technical rather than labour intensive, it is a complex industry scattered widely throughout the world. Agrochemicals include insecticides, fungicides, herbicides, plant growth regulators and all other chemicals designated for crop protection. In addition to chemical pesticides, many new biotechnological products designed to protect plants against disease and pests are currently under development. Fertilizers, although listed under the same NACE code, have separate NIMEXE codes and fall outside the definition of agrochemicals, and are dealt with in a separate section.

Current situation

The EC is the leader in the global agrochemical market with France, Italy, the United Kingdom, Spain, West Germany, Denmark and the Netherlands constituting major markets in both the Community and the world. EC countries accounted for five of the top six agrochemical markets in terms of real growth, with Spain recording the fastest growth rate due to EC investment in modern farming techniques. In 1988 the EC's plant protection market

was estimated at around 5.3 billion ECU while forecasts for 1995 put its value at approximately 5.6 billion ECU. In comparison, the US market, the world's second most important plant protection market, was estimated to be 4.7 billion ECU in 1988, and by 1995 is expected to stabilise at approximately 5.1 billion ECU.

Assuming that volumes and prices in the world market remain more or less stable and proportional to crop acreage, the EC should continue to be the world leader in the agrochemical market.

Structure of the Industry

Recent changes in the farming industry have greatly altered the structure of international competition in the agrochemical sector including:

- ❖ Changes in the demand and consumption of food;
- ❖ Agricultural overproduction in the developed countries;
- ❖ Reduction of arable land in the U.S.;
- ❖ Growing environmental concerns;
- ❖ Research into Biotechnological products;
- ❖ Modern farm management techniques.

World-wide the number of companies of importance in the plant chemical industry in 1985 was estimated at about 40, taking into account their research and develop-

ment capacity as well as their production levels or distribution networks: 16 American, 12 European and 11 Japanese firms. The majority of agrochemical manufacturing plants are located in either the US, Japan or Western Europe. The 13 largest companies listed below - of which 7 belong to the EC - generated in 1988 an estimated 75% of total sales.

In April 1989, Dow Chemical and Eli Lilly merged their agrochemical divisions to set up a new company, Dow Elanco, which ranks fifth in the world, with annual sales of 1.5 billion US dollars. Nearly all these firms are multinational chemical companies whose agrochemical divisions represent a relatively small part of the total sales of the group to which they belong.

As Europe moves towards the single market several policies proposed by the EC will have a direct impact on agriculture and subsequently the agrochemical industry:

- ❖ Monetary Compensatory Amounts, MCA;
- ❖ The Common Agricultural Policy, CAP;
- ❖ The establishment of European Currency Unit, ECU;
- ❖ Harmonisation of VAT and associated trade barriers;
- ❖ Community agrochemical product registration.

The more competitive farmers of the EC would benefit from the removal of MCAs. Removal of these Community subsidies might free CAP funds for other use within the industry such as crop diversification, capital investment and increased use of crop protection products.

Crops

In Europe the main consumer crops are cereals (35 million hectares), arboriculture and viticulture (11.6 million hectares), beet

(1.9 million hectares), protein crops (1.6 million hectares), potatoes (1.5 million hectares), and clover (1.3 million hectares). The United Kingdom, France, Spain, Italy and Germany produce between 70% and 90% of these crops. The improvement of yields during the decade has been achieved through the use of better seed varieties, extended irrigation systems, and, in many areas, as a result of high intensity farming, with sizable inputs of agrochemicals and fertilizers.

Product groups

Agrochemicals protect agricultural crops against a wide variety of pests, weeds, fungi, rodents and insects. When employed correctly, agrochemicals can significantly increase crop yields and improve the quality of agricultural produce. There are four main groups of agrochemicals:

- ❖ Herbicides;
- ❖ Insecticides;
- ❖ Fungicides;
- ❖ Plant growth regulators (PGR's).

Herbicides are used to control weeds. This is the largest product group and also the most rapidly growing market segment. Herbicides are particularly useful in developed countries such as the EC where labour is expensive and there has been a rapid expansion of their use since the early 1960s.

Insecticides are used to control insect pests particularly on crops grown in tropical and sub-tropical climates. These agrochemicals are widely used in southern EC Member States such as Spain and Greece, particularly in orchards. Fungicides are used to control fungal diseases mainly in high value crops such as cereals and vines. With much of northern Europe experiencing high rainfall and a

cool climate the use of fungicides is increasing. The fourth product group includes specialised agrochemicals as well as PGRs and is the smallest agrochemical market segment. Plant growth regulators are used in a wide variety of horticultural and agricultural applications to control plant size and growth rate. Steady growth has been observed in this product group recently and PGRs are seen to have an increasingly important place in the future of the agrochemical industry.

The market shares of the specialty agrochemicals such as nematocides, rodenticides and fumigants included in this group are very small in comparison to the four main product groups.

The five Member States France, Italy, the United Kingdom, Spain and Germany, whilst being the largest producers in the

Community, are also the largest consumers of plant protection chemicals, utilising 95% of the herbicides, 97% of the fungicides and 77% of total pesticides consumed in Europe.

Ciba-Geigy is considered as the leader regarding herbicides with an estimated world market share of 13%. Then come Monsanto with 9%, Bayer and BASF with 7% each.

In the world insecticides market, Bayer holds 14% followed by Rhône-Poulenc (10%), FMC and Hoechst (5% each).

In fungicides, the main companies are Bayer (18% of the world market), Ciba-Geigy (14%), Rhône-Poulenc (10%), Du Pont (8%), BASF and Sandoz (5% each).

Product distribution

There are three main types of distribution systems for agrochemicals in Europe: the

Table 1
Major companies' 1988 agrochemicals turnover

Company	Agrochemical Sales (\$m)	Total Group Sales (\$m)	Agrochemicals As % of Total
Ciba-Geigy (CH)	2 070	11 690	17.7
ICI (UK)	1 910	21 041	9.1
Bayer (D)	1 870	22 735	8.2
Rhone Poulenc (F)	1 688	10 740	15.7
Du Pont (F)	1 412	32 360	4.4
Monsanto (USA)	1 377	8 293	16.6
BASF (D)	1 025	24 645	4.2
Shell (NL)	995	79 142	1.3
Dow (USA)	959	16 682	5.7
Hoechst (D)	935	23 013	4.1
Schering (CH)	740	2 962	25.0
American Cyanamid (USA)	690	4 592	15.0
Sandoz (CH)	586	6 725	8.7

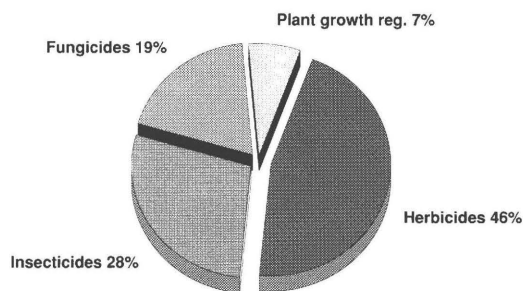
Source: Published accounts and CNWM estimates
County NatWest WoodMac

Table 2
Average yields of major crops worldwide, 1980-87

(Kg per ha)	1980	1987	Increase (%)
Wheat	1 877	2 289	22
Barley	2 030	2 305	14
Maize	3 060	3 566	17
Rice	2 770	3 110	12
Soybeans	1 581	1 901	22
Rapeseed	996	1 360	37
Sugar beet	29 284	36 640	25
Potatoes	12 800	15 857	24

Source: County NatWest WoodMac

Figure 2
World agrochemical market, 1988



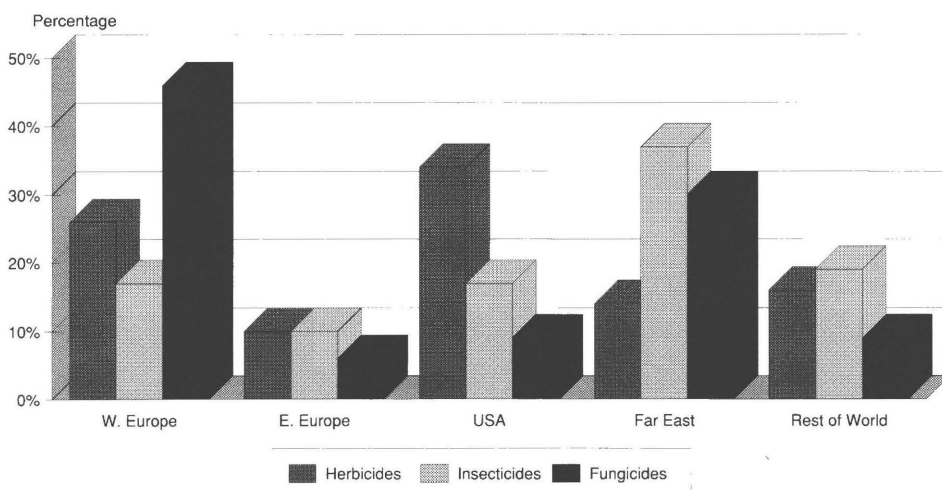
Source: Ciba-Geigy

English, the German and the Spanish systems. All other forms of distribution networks resemble one or other of these three systems.

The English distribution network involves few middlemen, a strong trading system, and relatively few technical services for the farmer. Correspondingly the English agrochemical prices are amongst the lowest in the Community. At the other end of the scale, the German system revolves principally around co-operatives providing a high level of technical service and support to its customers. As may be expected, agrochemical prices in Germany are the highest in the EC. Spain on the other

hand, has many stages in its distribution system between the time the product leaves the factory until it arrives at its final destination. The smaller the scale of the farm and the more isolated it is, the more intermediate stages there are. The Spanish system is the most complicated distribution system in the Community. In Italy by comparison, although there is widespread parcelling, the system is much simpler, for it relies on a powerful cooperative network. In general the longer the distribution chain the higher the price to the end user, and the more reduced the industry's capacity for added value.

Figure 3
World agrochemical usage, 1988



Source: County Natwest WoodMac

Product pricing

Methods and costs of distribution, both local and national, vary from one country to another and directly affect end user prices. Prices are also a result of market competition as well as differing distribution networks. For example in Denmark distribution channels account for 25% of the final price whilst in Germany it can be as high as 48.5%. As a result there are significant price differences in Europe. German prices are the highest in the Community at almost double those of Great Britain while prices in France lie somewhere between the two. Recently however, the price differential between EC Member States has narrowed and this trend will undoubtedly continue. For the past three years all companies introducing new products, with a single European market in mind, have launched their products with price differentials not exceeding 25%.

When the single market becomes a reality, the removal of physical barriers to trade should in theory lead to a single EC product pricing regime. However, the industry will retain flexibility to set higher pricing levels for products which do confer added benefits to the end user.

Ultimately, post 1992 agrochemical prices will probably converge to those of France which is the middle of the price range and which has a market of substantial size. The whole area of average or near average Community pricing will have far-reaching ramifications for the agrochemical distribution systems in terms of competition across national boundaries, pan-European ambitions, national distributors and the cooperative movement.

Trade

Recent statistics from Eurostat continue to

show a positive balance of trade in agrochemicals for the EC. After a peak trade performance in 1985 there was a slight decline till 1988, but figures from 1989 show that trade is again on the increase. Although imports have grown faster relative to exports, the Community's export position remains strong with total export value almost three times the total value of imports as shown in the figure 4 below. Insecticides form the bulk of EC exports followed closely by herbicides. Export of fungicides has been relatively low over the past decade but recent figures demonstrate a growth in trade nearly equalling that of insecticides.

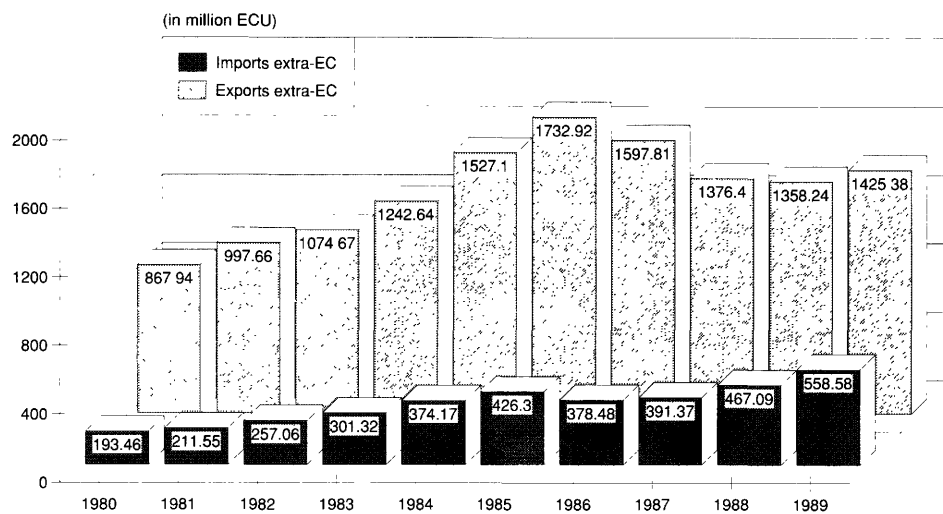
EC imports are made up mainly of herbicide and fungicide products. A relatively small volume of insecticides are imported for use mainly in the southern countries of the Community.

Future export growth is likely to continue. With the continuing increase in demand for food production in the developing countries Community agrochemical exports should be expected to increase well into the nineties. After a slight decrease during 1987, internal Community trade has increased over the last three years. This trend should continue as more and more physical and fiscal trade barriers within the Community are removed.

Product registration and legislation

One of the major challenges facing the EC agrochemical industry is the diversity of national product registration requirements which represents a considerable cost factor when launching new products. Proposed changes to procedures for agrochemical registration in the Community will have a significant impact on EC agrochemi-

Figure 4
External agrochemical trade
Extra-EC imports/exports



Source: Eurostat - Comext

cal firms.

The way in which the Commission currently views the use of pesticides is set out in its report on Environment and Agriculture published in 1987. Its aim is to reduce to a strict minimum the use of chemicals for agriculture, revise existing legislation and devote more attention to the broader effects of pesticides on the environment as a whole.

The Commission has considered harmonisation guidelines for agrochemicals since 1976. These proposals were discussed for six years before being withdrawn. New proposals put forward in 1989 suggest harmonisation of registration procedures for active ingredients at Community level and of formulations at national levels.

A possible stumbling block to agreement to this system is whether or not the national authorities will be able to grant provisional approval pending review of the active ingredient at Community level. Provisional authorisation procedure is currently used in a number of Member States such as France, the United Kingdom, and Ireland, however, objections to the concept

from other Member States may prevent its introduction into the Community as a whole. There remains a great deal of discussion before an agreed procedure on product data requirements for scientific evaluation of efficacy, toxicological and environmental considerations can be established. Unless substantial strides are made in the next six to twelve months the new registration scheme is unlikely to be in place before the end of 1992.

Research and development

Current R&D expenditure averages between 8% and 9% of sales in the agrochemical industry with biotechnology forming the key area of research and development programmes in virtually all major agrochemical companies. The main thrust of this research is in the area of plant genetics and the development of biopesticides. Trends indicate that expenditure on biotechnological research will continue to expand into the nineties. Genetic engineering techniques have made traditional plant breeding far more efficient and sophisticated. New plant varieties are being de-

Table 3
External trade - Insecticides

(million ECU)	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989
Exports extra-EC (1)	379.0	456.0	503.0	608.0	769.0	762.0	629.0	540.0	529.0	542.0
Index (2)	51.0	60.0	67.0	80.0	101.0	100.0	81.0	71.0	69.0	71.1
Imports extra-EC (1)	35.0	43.0	53.0	69.0	95.0	96.0	90.0	76.0	96.0	106.0
Index (2)	45.0	48.0	58.0	76.0	99.0	100.0	93.0	78.0	100.0	110.4
X/M (1)	10.8	10.6	9.5	8.8	8.1	7.9	6.9	7.2	5.5	5.1
Trade intra-EC (1)	128.0	161.0	180.0	238.0	291.0	265.0	260.0	281.0	315.0	336.0
Index (2)	60.0	66.0	74.0	98.0	110.0	100.0	98.0	106.0	122.0	126.8
Share of total (%)	23.7	23.1	25	27	27.6	25.4	27.3	33	35.2	39.6

(1) Reporting countries - 1980 EC9; 1981-83 EC10
Partner country - extra / intra EC12. Greece estimated.
(2) Taking into account changes in EC membership
Source: Eurostat (Comext)

Table 4
External trade - Herbicides

(million ECU)	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989
Exports extra-EC (1)	314.0	302.0	304.0	289.0	362.0	433.0	381.0	356.0	350.0	351.0
Index (2)	73.0	70.0	70.0	67.0	84.0	100.0	88.0	82.0	81.0	81.1
Imports extra-EC (1)	122.0	94.0	111.0	131.0	169.0	152.0	133.0	168.0	191.0	244.0
Index (2)	86.0	64.0	76.0	90.0	111.0	100.0	88.0	111.0	125.0	160.5
X/M (1)	2.6	3.2	2.7	2.2	2.1	2.9	2.9	2.1	1.9	1.4
Trade intra-EC (1)	377.0	409.0	458.0	440.0	563.0	641.0	689.0	678.0	761.0	845.0
Index (2)	61.0	67.0	75.0	72.0	88.0	100.0	107.0	106.0	118.0	131.8
Share of total (%)	53.2	57.8	58.7	54.4	55.5	52.8	55.4	57.7	61.1	65

(1) Reporting countries - 1980 EC9; 1981-83 EC10
Partner country - extra / intra EC12. Greece estimated.
(2) Taking into account changes in EC membership
Source: Eurostat (Comext)

Table 5
External trade - Fungicides

(million ECU)	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989
Exports extra-EC (1)	108.0	151.0	178.0	232.0	261.0	397.0	448.0	326.0	328.0	386.0
Index (2)	27.0	39.0	45.0	59.0	66.0	100.0	112.0	82.0	83.0	97.2
Imports extra-EC (1)	28.0	63.0	78.0	80.0	87.0	152.0	120.0	107.0	137.0	178.0
Index (2)	18.0	42.0	53.0	53.0	57.0	100.0	79.0	70.0	89.0	117.1
X/M (1)	3.9	2.4	2.3	2.9	3.0	2.6	3.7	3.1	2.4	2.2
Trade intra-EC (1)	191.0	225.0	251.0	315.0	430.0	484.0	439.0	382.0	442.0	558.0
Index (2)	42.0	50.0	55.0	69.0	89.0	100.0	91.0	79.0	91.0	115.3
Share of total (%)	58.1	56.5	54	53.6	63.1	57.5	50.6	57	58.7	59.4

(1) Reporting countries - 1980 EC9; 1981-83 EC10
Partner country - extra / intra EC12. Greece estimated.
(2) Taking into account changes in EC membership
Source: Eurostat (Comext)

veloped with features such as:

- ❖ resistance to pests and disease;
- ❖ resistance to herbicides;
- ❖ resistance to frost or drought;
- ❖ improved produce quality.

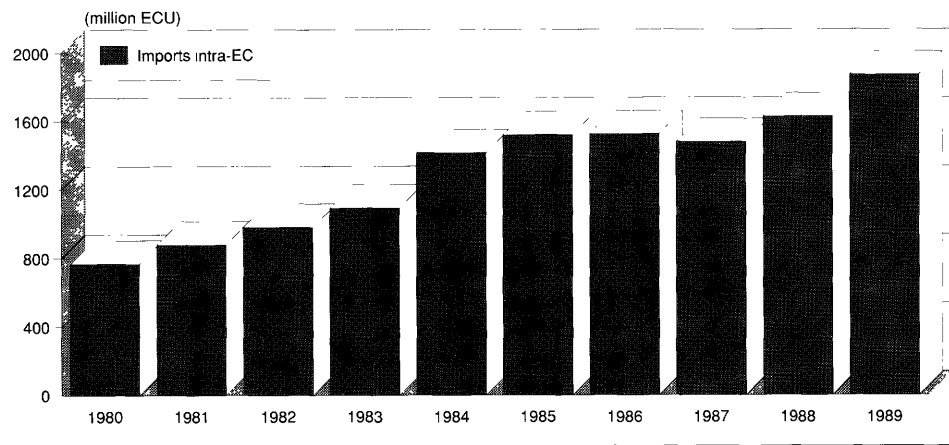
Biopesticide research involves utilising naturally occurring insect and plant pathogens to control insects, fungi and weeds. Such advances in biotechnology will lead to novel microbial products and new crop varieties which will become important crop protection agents and increasingly supplement or supplant the effects of agrochemicals.

Crop resistance to insect pests and fungal pathogens will gradually replace some insecticide and fungicide usage. Initially resistance will be limited to individual pests or pathogens and it will be some time before pest and disease complexes will be controlled exclusively by biotechnology without the complementary use of agrochemicals. In the meantime agrochemical research is also directed at lowering the effective dose rates and environmental residues of agrochemicals currently employed in the market place.

Research in biotechnologies will not noticeably reduce total pesticide sales but it will cause modifications to the types of products and to the competitiveness of those involved. The products marketed will be safer for the environment and give stronger pest control, whilst the first results of biotechnology research should appear on the European market during the next decade.

The rate of uptake of this new technology will be limited at least as much by economics compared to current agrochemicals as it will be by the time taken to develop and register the technology. Biotechnology

Figure 5
External agrochemical trade



Source: Eurostat - Comext

offers the promise of industry revival but it will be accompanied by a demanding legislative framework, some of which is already in place, which will limit the rate of commercial exploitation.

Environmental protection

With the "European Year of the Environment" highlighting public awareness of environmental issues, the agrochemical industry has increasingly come under scrutiny. Whilst respecting environmental needs the industry must also balance its role of crop protection and the maintenance of reliable food supplies.

30% of all potential food production worldwide continues to be lost to pests, diseases and weeds. Without agrochemicals this figure would double. Advances in the agrochemical industry have had a positive impact on food production. Pesticide development has almost eliminated the risk of agricultural disasters.

The challenge faced by the industry today is to find a balance between environmental concerns and the production needs of modern agriculture. The industry invests major resources to ensure that their products comply with government regulations on environmental safety. In fact for every

new product tested only one in 15 000 - 20 000 reaches the market place.

Whilst it is true that some early pesticides were toxic to man and the environment, modern agrochemicals are designed to be effective against pests while having a minimum impact on the environment. The EC is moving towards high value/low spray rate products in attempts to reduce agrochemical usage with biotechnological R&D featuring largely in the search for new and environmentally safer plant protection products. Future crop protection will probably rely on a combination of traditional and new methods for controlling insects, weeds and pests.

The impact of 1992

Two specific areas of the agrochemical industry will be affected by the establishment of the single Community market. The first pertains to the removal of physical barriers to trade theoretically leading to a single EC product pricing regime. The second concerns registration of agrochemicals. Product pricing will undergo an averaging out effect, probably close to French prices, the mid-range of agrochemical prices in the EC. In addition, the French agrochemical market is the largest

of all the Member States and on that basis market forces will ultimately determine the outcome of pan-EC pricing levels. Registration of agrochemicals within the Community as discussed previously seems to be developing towards a two tier system. This system will probably follow the proposal made in 1989 which suggests approval of active ingredients at the Community level with separate approval of formulated products at national level. The single market concept itself will not bring about all the changes in the agrochemical industry in the EC. Any changes that do occur as a result of a single European market would probably have happened anyway, although the time scale would have been longer.

In conclusion, the establishment of the single European market, whether in 1992 or soon after is going to increase competition in the agrochemical sector resulting in a more limited number of participants. It is hoped that some cost gains can be achieved by the industry through regulatory harmonisation and efficiencies

to offset the expected lowering of prices foreseen in some Member States.

Industry outlook

On the basis of agrochemicals product prices, post 1992 selling at or near the current French price levels throughout the Community, and given the likelihood that crop acreage will be no higher than at present, the EC regional market will continue to hold its leadership position in the world agrochemical market.

Long-term growth will be at a lower rate worldwide (2-3% per annum not including inflation) with a higher rate in less developed countries (5% per annum) where intensification of agriculture will continue.

Low growth of agrochemicals will continue in the developed countries as a result of agricultural reform to restrict surpluses, Japanese agricultural liberalisation and further subsidy reduction worldwide.

Competition between companies will increase in intensity and further rationalisation will occur through acquisition and mergers. During the last two years there have been numerous takeovers. In many

instances the plant biotechnologies were the target for these mergers; this was manifested by the large companies taking over the seed and biotechnology companies. All of them now have research teams at work on the new biotechnologies and their applications for agriculture. However, the commercial benefits of this work will only be felt in the medium or long-term.

The most successful companies in the agrochemical industry of the future are those who are strong internationally, who have effective R&D aimed at generating both chemical and biological products and who give high priority to ensuring that their products are environmentally safe.

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Reviewed by: DRI Europe

The Community soap and detergent industry operates in a very competitive environment but benefits from considerable potential in both the industrialised and developing countries.

The world market for soaps and detergents is following a growth evolution around two differing trends.

On the one hand, there is a relatively stable market in the developed countries where growth is more related to new product introduction (liquid laundry detergent), new formulae (biological products) or even changing habits (trend towards washing laundry at lower temperatures).

On the other hand, there is a sharp growth in the use of cleaning products in southern countries, under the impulse of accelerated industrialisation and migration from the country towards the town.

Whilst the supply of raw materials is concentrated in the South, the finished product offer is dominated by a few Northern transnational companies.

At present, efforts undertaken by Community companies to penetrate export markets is heightening competition.

The latter mainly influences product presentation and sales promotion but also influences the raw materials used. Changes in demand and the costs of raw materials have varied the basic product offer and have brought about upstream production diversification.

Water eutrophication caused by pouring waste water in lakes and waterways increasingly preoccupies public opinion. New legal directives have been introduced, to varying degrees from country to country, bringing about changes in product composition.

Sector description

The statistical information below covers:

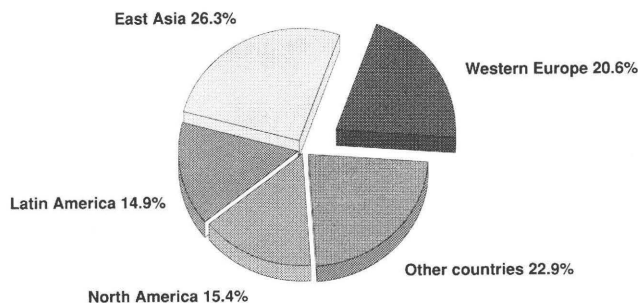
- toilet, household and industrial soaps;

Table 1
Soaps and detergents
Main Indicators, 1983-89

(million ECU)	1983	1984	1985	1986	1987	1988	1989	1990 ^(?)
Apparent consumption	7 612	8 150	8 491	9 177	9 826	10 504	11 163	N/A
Net exports	401	472	521	484	461	544	758	882
Production ⁽¹⁾	8 013	8 622	9 012	9 661	10 287	11 048	11 921	N/A

⁽¹⁾ 1988-89 Eurostat estimates/forecasts
^(?) Estimated
Source: AIS, Eurostat (Comext)

Figure 1
World consumption of laundry cleaning products
and other cleaning products, 1988
Total: 17.5 million tonnes



Source: Colin A. Houston & Associates

– washing products, surface cleaners and washing powders.

Household articles used for clean(s)ing such as polishes, stain removers, household disinfectants, deodorizers, cleaning products for windows and mirrors etc. are not included. The maintenance product sector is described elsewhere in this document.

Present situation

Western Europe is a very large market for cleaning products in general. In fact, according to estimates by Colin A. Houston and Associates, laundry and cleaning domestic product consumption in Western Europe represents almost a fifth of world consumption (20.6% in 1988 being 3,6 million tonnes).

According to the International Association

of the Soap and Detergent Industry, European soap and detergent production was 9 million tonnes in 1988, with a value of 11 billion ECU. Figure 2 shows that Europe mainly produces goods for laundry, cleaning and scouring (89% of 1988 production) of which about half are liquid products (49%) and 43% laundry products. It is generally considered that the European surface cleaning product market, as in North America, is stable. However, table 1 indicates that the production value of soaps and detergents shows since 1983 an annual growth rate of about 7.6%. It can be seen that the take-up of liquid laundry products was relatively slow in the EC, but the delay, in relation to the USA is being considerably reduced. Apart from ecological reasons, liquid laundry products benefit from easier use, storage and packaging for sale. At present, it is estimated that these products represent 35%

Table 2
Soaps and detergents
EC trade in current value

(million ECU)	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990 ^(?)
Exports extra-EC ⁽¹⁾	428.0	492.0	467.0	479.0	552.0	610.0	574.0	569.0	683.0	907.0	1 039.3
Index ⁽²⁾	70.2	80.7	76.6	78.5	90.5	100.0	82.0	82.0	98.0	130.0	170.0
Imports extra-EC ⁽¹⁾	162.0	201.0	225.0	78.0	80.0	89.0	90.0	108.0	139.0	149.0	157.2
Index ⁽²⁾	182.0	225.8	252.8	87.6	89.9	100.0	101.1	121.3	156.2	167.4	177.0
X/M ⁽¹⁾	2.6	2.4	2.1	6.1	6.9	6.9	6.4	5.3	4.9	6.1	6.6
Trade intra-EC ⁽¹⁾	361.0	416.0	496.0	561.0	668.0	685.0	708.0	843.0	1 102.0	1 144.0	N/A
Index ⁽²⁾	73.0	60.7	72.4	81.9	97.5	100.0	102.0	121.0	158.0	164.0	N/A
Share of total (%)	45.0	46.0	52.0	54.0	55.0	54.0	57.0	60.0	63.0	57.0	N/A

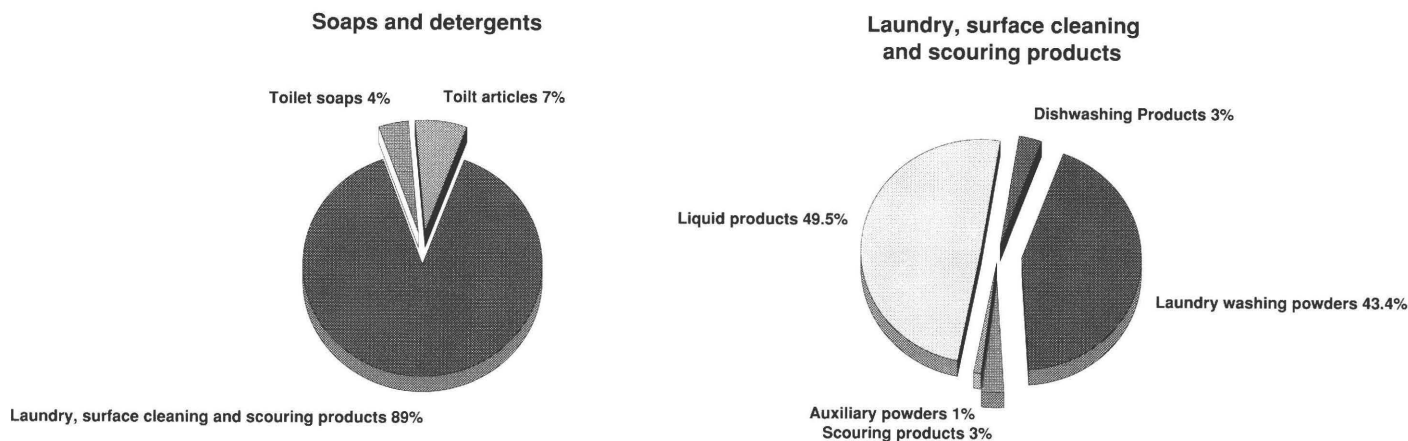
⁽¹⁾ Reporting countries: 1980 EC9; 1981-83 EC10; 1988-89 Greek figures estimated

⁽²⁾ Taking into account changes in EC membership

^(?) Estimated

Source: AIS, Eurostat (Comext)

Figure 2
European production structure, 1988
total: 9 million tonnes



Source: AIS

of the surface cleaning products market in the UK, 20% in Germany and 10% in France. Changes in taste, consumer habits and technologies require products and, consequently their production processes to be quickly adaptable. Intense competition within the soap and detergent industries is specially reflected in the sums invested in sales promotion. In 1989, expenditure on powder and liquid detergents in Europe was around 470 million ECU, being 2.5% of turnover.

Although the level of foreign trade is relatively unimportant, the balance (exports outside the EC/imports into the EC) is positive; by about 5% in the 1980's. In fact, in 1989, for a total export value of 907 million ECU (7.6% of production), the EC imported soaps and detergents to the value of 149 million ECU. Inter-EC exchanges grew sharply in 1987 and 1988, increasing by 55% between 1986 and 1988. The low level of soap and detergent consumption in the meridional countries recently arrived within the EC is inherent to this evolution. The internal structure of imports and exports in value has remained unchanged in relation to the previous decade. The EC

mainly exports washing, surface cleaning and scouring products (in 1989, 55% of all exports) and toilet articles (37%), but very few domestic and industrial cleaning products. Regarding the majority of imports, washing, surface cleaning and scouring products represent 60%.

Industry structure

The world market for cleaning products is dominated by five major multinational groups of which three are within the Community: Unilever (Netherlands and Great Britain), Henkel (Germany), Benckiser (Germany), Colgate Palmolive (USA), Procter and Gamble (USA). For many years these companies concentrated on their home markets. At present they are intensifying their efforts to penetrate other continents, notably by buying out or buying shares in companies often placed downstream of their production process.

In Europe, the soap and detergents sector accounts for about a thousand manufacturing and distribution companies which vary from those who only supply the local market to those large international companies which serve the world market. In fact the European and American multinational com-

panies possess a substantial number of production units within the Community. It follows that another specific feature of the sector is the trend to develop brand names well known to the consumer rather than company names. The International Association of the Soap and Detergent Industry at present informs the small companies so that they prepare themselves for the internal market in 1993, whilst the larger companies are already ahead of them having concentrated their production and technical resources to minimise production costs.

Employment

The number of people employed in the European soap and detergent industry is considered to be stable at about 80,000 to 85,000 employees. This stability, linked to technological advances, implies an improvement in productivity. However, the growing complexity of the production process requires continuous employee training. The restricted number of young people entering the employment market reinforces the need for training programmes for existing employees.

Table 3
Soaps and detergents
Breakdown of external trade by product

(million ECU)	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989
Exports extra-EC										
Toilet products	190	240	217	184	235	250	234	240	298	332
Household and industrial products	33	38	35	32	44	48	39	37	44	75
Washing products, surface cleaners and scourers	205	214	215	263	273	312	301	292	341	500
Imports extra-EC										
Toilet products	131	157	177	20	21	24	23	25	37	51
Household and industrial products	2	4	3	3	4	5	5	6	13	11
Washing products, surface cleaners and scourers	29	40	45	55	55	60	62	77	89	87
Imports intra-EC										
Toilet products	113	124	145	158	183	190	186	211	272	312
Household and industrial products	15	20	26	28	30	33	32	33	70	66
Washing products, surface cleaners and scourers	233	272	325	375	455	462	490	599	760	766

Source: Eurostat (Comext)

Production and consumption

It is generally admitted that soap and detergent consumption is closely linked to the standard of living. During the last few years the trend towards washing laundry at lower temperatures has been clearly marked. This originates from protecting delicate materials and energy conservation. In response to this demand, the introduction of products operating at lower temperatures has reinforced this evolution. Liquid detergents in particular, which are easy to use, meet this demand. On average they represent 18% (by value) of the EC market.

Over the last ten years, washing machine purchases have increased and purchases appear to rise in relation to the number of laundry products. Apart from these evolutions, change on the part of industrialists must also occur in accordance with the geographic context in which they operate. In fact, the socio-cultural context, history, climatic conditions can considerably in-

fluence consumer needs and demand. If globally, European population growth remains moderate, soap and detergent consumption should increase further in Spain and Portugal.

Distribution

The soap and detergent industry not only addresses individual consumers but also hotels and restaurants. For the latter, products, packaging and distribution are quite specific. Over the last twenty years the emergence of hypermarkets has considerably modified the distribution system. In fact, this relatively concentrated product offer has resulted in an increasingly channelled demand. It follows that the industries now have more influential buying groups, representing increasingly powerful pressure groups. Furthermore, over the last few years, distributors have launched their own products onto the market (own label brands), thus heightening existing competition. In 1988, their product offers represented 6% by value of the detergent market.

Taking account of the importance of shelf space in supermarkets and hypermarkets, and also at the manufacturers, many organisations have invested in computer systems. In fact computer shelf (sales department) management contributes to sales growth.

Investments

In this very competitive environment, material and advertising investments must be sustained and considerable funds are allocated to research and development. On average, a company dedicates 2.5% of turnover to R&D. In certain cases, companies link to pool their research effort. R&D investment enables future demand to be better understood, develops new products and also improves existing products to respond to, amongst other issues, the pollution problem. In the production process, the use of enzymes in laundry washing powders is a sign of industrial development, especially as the effectiveness of these biological powders on stains, blood and eggs for example, is widely rec-

ognised. The appearance of liquid formulae, particularly effective at low temperatures, also constitutes a recent evolution.

Environment

A high level of nutritive substances causes eutrophication of water surfaces, i.e. a decrease in oxygen which engenders an abnormally high level of aquatic vegetation.

This ecological problem is of concern to many Member States. On the other hand, the role played by detergents containing phosphates in this process and the measures to be taken on this issue are still the subject of controversy. Detergents containing phosphates only represent a small percentage of the phosphate present in rivers and lakes. The majority comes from industrial, agricultural and human waste. Measures taken vary greatly between Member States. Italy has prohibited the use of phosphates in laundry washing products. In Germany the level is limited but use is tolerated for a few years to come. In Benelux agreement has been reached between the industrialists and the government to promote phosphate-free products. In the UK a recent report revealed that prohibiting phosphate products would be useless as the rivers are short and fast running in the major part of the country. Generally, it is recommended that purification systems are installed to enable phosphate extraction from waste water before pouring it into waterways.

Detergent plastic packaging is also involved as an ecological preoccupation. For this reason, recycled paper and cardboard usage is on the increase. In the same vein, some companies have introduced refillable containers and are presently carrying out research into recycling plastic bottles.

Over the last few years, consumer interest in the composition of the products purchased has risen. In response to this, the Commission, the Member States and the detergent industry have developed a system of constituent labels which will be implemented spontaneously by all companies before the end of 1990.

Outlook

On the one hand, growth in the soap and detergent sector mainly in the medium to long-term depends to a great extent on consumer behaviour and the development of other sectors such as textiles and household equipment. On the other hand, protection of the environment and product safety play an ever-increasing role in industrial development. From this point of view, the soap and detergent industries are well placed to minimise the ecological impact of their products and to create healthy and safe work conditions.

However, there still remains a considerable growth potential, notably in the Southern countries, the countries recently absorbed into the EC and the Eastern countries. The conquest of the Eastern European market after the recent opening of frontiers will depend upon European companies' ability to woo them and export more products. However, the Eastern European countries' adjustment to a market economy system requires European manufacturers to wait for some time. Also, in the long term, exports to Eastern Europe could be substituted by the setting up of local production facilities. Taking into account the analysis of these various factors and the prevailing favourable conditions, it is reasonable to suppose that production growth in this sector will be sustained at a rhythm more or less equal to

that of European private consumption, and will be in the region of 3% per annum on average for the next five years.

AIS: Association Internationale de la Savonnerie et de la Détergence (International Association of the Soap and Detergent Industry).
Address: Square Marie-Louise 49, B-1040 Brussels;
tel: (32 2) 230 83 71; fax: (32 2) 230 82 88.

Revised by: DRI Europe



The EC and US markets are currently equal. 1989 saw the EC marginally overtaking the American market. During the 1980s, there were significant increases in sales within this sector, the major developments being the introduction of new products, new consumer growth and the internationalisation of trademarks.

Although the standard of living determines the development potential of this sector, fashion and advertising also have a considerable influence on sales trends.

Traditionally aimed at the export market, the industry was well versed in how to retain and increase its worldwide market shares during the 1980s and is now experiencing a period of consolidation.

The outlook for the EC perfumery, cosmetics and toiletries market is that growth should continue throughout the 1990s at an average annual rate of 5% over the next three years.

Breakdown of the sector

The industry encompasses two major product categories: Products which are a daily feature of our lives and luxury products which satisfy a different range of criteria.

More specifically, products falling within this sector can be categorised as follows:

- ❖ hair products;
- ❖ beauty products;
- ❖ toiletries;
- ❖ alcohol-based products;
- ❖ toiletries for men.

Current situation

In 1989, domestic consumption of perfume, cosmetics and toiletries accounted for approximately 1.5% of overall consump-

tion within the European Community. During the same year, growth within the perfume, cosmetics and toiletries industry continued as during previous years, with a 9.4% increase in the value of sales, contrary to 7.3% in 1988. Between 1985 and 1989, ex-factory sales increased by 28%, amounting to a total of 14 billion ECU in 1989.

In terms of product share, hair products accounted for the majority of sales within the industry (28% in 1989), followed by beauty products (25%) and toiletries (23%).

The four largest EC countries (Germany, France, Italy and the United Kingdom) are also the four major markets, accounting

Table 1
Perfumery, cosmetics and toiletries
Main indicators, 1981-90

(million ECU)	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990 ^(*)
Ex-factory sales ⁽¹⁾ ⁽²⁾	6 850	7 582	7 705	8 430	10 963	11 334	11 948	12 815	14 022	14707

(¹) Excluding exports and toilet soaps

(²) 1980-84 EC10

(³) Estimates

Source: COLIPA

for 82% of sales within the Community. In 1989, the various market assessments were: Germany 3.4 billion ECU, France 3.2 billion ECU, Italy 2.7 billion ECU and the United Kingdom 2.1 billion ECU.

There is a strong link between individual product consumer trends and living standards. The main consumer trends apparent during the 1980s led, inter alia, to great diversification.

It would appear that there were initial changes in product patterns in the hair care market, which influenced the make-up market during recent years. The promotion of the natural look for women, together with the introduction of products such as gels and fixing mousses largely explain this development.

In demographic terms, despite the stable or declining birth rate, between 1983 and 1988 there was a 3.3% increase in the EC 15-64 year-old range, with substantial increases in the Southern countries of Europe. Between 1983 and 1988 the number of adults in Spain, for instance, increased by 5.2%.

Table 2
Perfumery, cosmetics and toiletries
Ex-factory sales by product category

(%)	1989
Alcohol based products	8.1
Beauty and care products	25.2
Hair products	28.0
Toiletries	22.7
Men's toiletries	6.1
Other products	9.9
Total	100

Source: COLIPA

Irrespective of age, European consumers are becoming increasingly aware of their appearance, personal hygiene and health. Campaigns launched to combat skin cancer, for example, have resulted in the greater use of sun creams. An ever growing array of natural products is now available. Bath, shower and hair mousses and gels have replaced the more conventional products, as have skin products, especially those designed to reduce the signs due to ageing, all of which exemplify the current trend.

The focus on men now forms an integral part of the market and is gradually following the same trend as the female care and consumer patterns. During the last 5 years the growth in products for men has risen sharply and there is no indication of any decline. Although such growth is mainly a result of the introduction of new consumers, the successful promotion of product "loyalty" has stabilised sales. In 1989, the 18% growth in products for men outstripped the 9.3% overall EC market increase, the main appeal being the perfume lines. Fashion instigated the trend (e.g. wet-look gel), coupled with the general concern for improved grooming and care.

Marketing is also responsible for these developments, focusing more and more on skin hygiene and the protection of the environment. Within the industry, the combination of research and marketing is particularly important. Other forms of pro-

motion such as selective marketing (solely in pharmacies or luxury perfume and cosmetics retailers) are currently practiced whilst creative product name selection (e.g. identifying the product, more often than not a perfume, with a specific personality or given event) has become an important marketing technique.

Structure of the sector

The four firms which dominate the world market are as follows:

- ❖ L'Oréal (France): 1989 turnover in toiletries and cosmetics - 3.4 billion ECU;
 - ❖ Unilever (United Kingdom/The Netherlands): 3 billion ECU
 - ❖ Shiseido (Japan): 2.6 billion ECU;
 - ❖ Avon (U.S.A.): 2.6 billion ECU;
- Followed by:
- ❖ Procter and Gamble (U.S.A.);
 - ❖ Wella (Germany);
 - ❖ LVMH (France);
 - ❖ Schwarzkopf (Germany);
 - ❖ Sanofi (France);
 - ❖ Revlon (U.S.A.);
 - ❖ Estée Lauder (USA)

The consolidation of firms continued in 1989.

However, whilst the major groups grew in strength, smaller companies began to make their presence felt with numerous firms being formed, accompanied by a sharp rise in national companies. Local producers tended to concentrate more on developing their exports and on mergers to give their products wider mar-

ket cover.

With competition becoming increasingly fierce at international level, major firms are seeking to take advantage of any opportunity to form strategic mergers - even if the cost is high, in order to:

- ❖ safeguard their existing market positions;
- ❖ conquer new markets abroad,;
- ❖ penetrate new market sectors.

Acquisitions continued during 1989 and 1990, confirming this move towards consolidation. In November 1989, Sanofi bought out Stern perfumes (acquired in 1988) from the Avon Group, and in April 1990, LVMH and L'Oréal took control of Lanvin. In 1989, certain mayor mass consumer market companies established footholds within the industry:

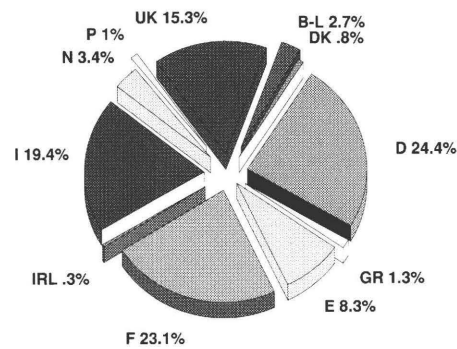
- ❖ Unilever bought out Fabergé/Elizabeth Arden, together with Calvin Klein perfumes; the group also took control of Valentino in Italy and Evyan in the United States. The Fabergé buy-out marked a strengthening of Unilever's position within the deodorant, hair product and perfume market; Calvin Klein perfumes encouraged penetration of certain top-of-the-range markets;
- ❖ In September 1989, Procter and Gamble, which had no previous track record in the perfume sector, acquired Noxell.

In addition, several pharmaceutical groups decided to return to their basic activities, thus withdrawing from the cosmetics field, one such group being the British company, Smithkline Beecham, which in May 1990 sold off its cosmetic division to the German detergent manufacturer, John A. Benckiser.

Commercial trends

In 1989, the trade of perfumes, cosmetics and toiletries within the Community slightly

Figure 1
Sales ex-works within the EC, by country, 1989
(14.02 billion Ecu)



Source: Colipa

exceeded that outside the EC, amounting to 5.638 billion ECU, compared with the early 1990s when the level of exports exceeded trade within the Community. Between 1980 and 1989, the average annual rate of growth for trade within the Community amounted to 12.5%.

During 1980-89, foreign trade continued to be very favourable for the industry. The export/import ratio remained stable during the 1980s, with the value of exports outside the EC exceeding that of imports by four to one. In 1989, exports outside the EC amounted to 4.961 billion ECU against 1.312 billion ECU for imports, giving a trade balance surplus of 3.649 billion ECU. Between 1980 and 1989, the value of exports outside the EC increased by an average of 9.2% per year whilst extra-EC imports increased by 10.5% per year.

The internationalisation of trade marks is one factor which helps to explain the resilience of exports, coupled with the reputation of certain products, especially perfumes e.g. the amount of perfume sold in the duty-free shops of airports throughout the world clearly illustrates the high reputation of French perfumes. Nevertheless, the industry has been affected by foreign competition, with products manufac-

tured by the Japanese company, Shisheido, for example, becoming increasingly available within our markets. The construction of a cosmetics factory in the Loire Valley also reflects the internationalisation of the perfume, cosmetics and toiletries industry. Finally, the rapid consumer growth recorded in the developing countries as a result of improved living standards and high population growth levels indicates considerable potential for export.

The environment

For two or three years, environmental problems have become important issues both for producers and consumers, more especially problems relating to air and water pollution. Certain cosmetics and perfume producers have now implemented active, environment-friendly policies which act as a source of inspiration for the creation and marketing of new products (e.g. natural products). Others show less concern. However, in the years to come all manufacturers within this sector will be obliged to investigate ways of reducing the effect of their products on the environment. Attention is being focused on two specific possibilities: the biodegradable properties of toiletries and cosmetics, together with the incorporation of preservatives in their manu-

Table 3
Perfumery, cosmetics and toiletries
EC trade in current value

(million ECU)	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989
Exports extra-EC (1)	2 004.0	2 365.0	2 493.0	2 797.0	3 448.0	3 894.0	3 792.0	3 879.0	4 256.0	4 961.0
Index (2)	51.5	60.7	64.0	71.8	88.5	100.0	92.2	94.4	103.5	114.1
Imports extra-EC (1)	505.0	610.0	671.0	757.0	926.0	998.0	939.0	1 005.0	1 186.0	1 312.0
Index (2)	51.0	61.1	67.2	75.9	92.8	100.0	89.6	95.9	113.1	125.1
X/M (1)	4.0	3.9	3.7	3.7	3.7	3.9	4.0	3.9	3.6	3.8
Trade intra-EC (1)	1 828.0	2 104.0	2 458.0	2 755.0	3 379.0	3 809.0	4 005.0	4 506.0	5 110.0	5 638.0
Index (2)	48.7	55.2	64.5	72.3	88.7	100.0	100.0	112.6	127.7	141.0
Share of total (%)	46.5	46.1	48.7	48.7	49	49.3	51.3	53.7	54.3	52.8

(1) Reporting countries - 1980 EC9; 1981-88 EC10

(2) Taking into account changes in EC membership

Source: Eurostat (Comext)

ufacture. Problems relating to packaging such as aerosols which contain ozone layer damaging CFCs (particularly deodorants and hair fixing products) are also inherent to this problem.

The impact of 1992

The perfumery, cosmetics and toiletries industry must now comply with the regulations prescribed or those being introduced by the European Commission within the context of the implementation of the 1992 Single Market. Although the regulations relating to the environment form part of this administrative context, the disparity between prices for the same product within the various Member States reflects a certain fragmentation of the market which should start to disappear. By way of an example and according to a survey carried out by the consultants "Runzheimer Mitchell Europe", a bottle of Timotei shampoo (200 ml) costs 60% more in Amsterdam than in London (exclusive of tax). The explanations for this situation as given by the companies themselves are numerous e.g. marketing strategies which continue to be based on the various geographical entities which make up the EC; different promotion, sales and distribution costs; the fact that they, the manufacturers, have little control over the retail cost of their products

within the various countries.....

Within the context of the Single Market, the essential points tackled by the Commission relate above all to consumer protection, more especially with regard to health and welfare. The Commission is particularly concerned that consumers are advised as to the contents of products, particularly given that the distinction between a toiletry and a medicinal product is sometimes extremely vague (e.g. numerous alleged hair shampoo "remedies").

The EC Commission is preparing a draft sixth amendment to the directive which focuses on cosmetics. This concerns, inter alia, the implementation of a glossary of any contents which may feature in the composition of cosmetic products within the European Community. The draft is aimed at increasing consumer awareness, improving the safety of products and providing for the free circulation of cosmetics within the confines of the EC.

The proposals of the Commission should be available during the first half of 1991 and one can only hope that the revision of this directive will serve to strengthen the EC industry and reinforce its success on the world markets.

Outlook

Given the wide range of products featured within this industry, the prospects for growth vary in accordance with the type of product in question.

There has been a sharp growth in hair care products within the EC market during recent years; it appears this trend may reverse as the markets gradually reach saturation.

Growth in beauty and skin care products is set to continue.

There has been considerable growth in products for men, more especially perfumes and skin care products.

Overall, this is an industry which is marked by relatively high rates of growth within the EC, fierce international competition and strong export development potential. The growth rate for sales should continue to exceed an average of 5% per year over the next three years.

Written by: DRI Europe

The industry is represented at the EC level by:
COLIPA: Comité de Liaison des Associations Européennes de l'Industrie de la Parfumerie, des Produits Cosmétiques et de Toilette, Address: Rue de la Loi, 223, Bte 2, B-1040 Bruxelles; Tel: (2) 230 91 79; Telex: 21908 COLIPA B; fax: (2) 231 15 87



On the whole, the maintenance products industry is a relatively stable market, in spite of the fact that it incorporates variations specific to each geographical region where factors such as customs and climate influence consumer behaviour. Over the past ten years, various factors have had a significant influence on the industry. Competition is becoming increasingly fierce; competition between producers but also pressure generated by the ever more concentrated distribution system.

Demographic changes, the structure of households (a growing number of smaller units) and the ever growing number of working women are all determining factors for this industry. The new awareness of environmental problems and the resulting regulations have likewise influenced the manufacture of maintenance products (particularly in the case of aerosols). Considerable sums are therefore being invested in R&D. Finally, in view of the nature of the product and the potential which remains to be tapped in certain southern Member States of the EC, the current growth looks set to continue for some time.

Definition of the sector

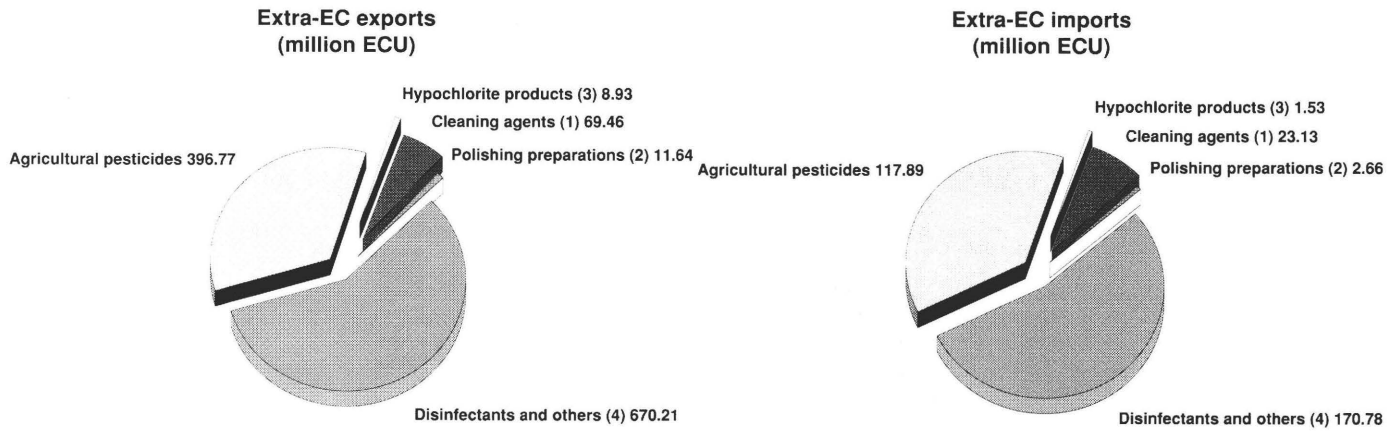
Maintenance products are defined as preparations sold in ready-to-use form or which are easy to use when diluted with water. Such products are mainly intended for domestic use but can also have certain industrial applications. The maintenance products industry encompasses products such as cleaning preparations (floors, cars, windows, etc.), metal polishing prep-

arations, scouring preparations, wax, disinfectant and bleach household insecticides, stain removers, etc.

It thus covers the wide range of products needed in order to maintain healthy, hygienic conditions in the modern home.

Such products contribute to the efficiency of our daily environment, help to save time in household tasks and raise our standard of living.

Figure 1
Maintenance products
Structure of external trade, 1988



(1) Includes cleaning agents and maintenance products for cars, wood, leather and footwear
(2) Products for polishing metal and cookers
(3) Hypochlorite products and similar preparations for domestic and industrial use
(4) Household disinfectant and deodorants, household insecticides and anti-parasite preparations
Source: Eurostat and FIFE

The EC market

Within the EC, consumption of maintenance products varies markedly from one Member State to the next, according to the climate, local customs, habits, etc. From this point of view, the EC market is made up of a number of markets, each developing independently of the others. Over the past ten years, the market for maintenance products has developed in two respects: on the one hand, it has become more consumer-orientated and on the other, it is gaining ground in an increasingly competitive environment. The number of households is on the increase; they are smaller than in the past, with a growing number of single-parent families. The ageing of the population brings with it the need for more intensive use of space and, hence, more frequent maintenance. In addition, a growing number of women are now working outside the home. All these various reasons explain why consumers are now looking for practical products, designed to help save time. These requirements in turn create

the need for continuous efforts in terms of research and development in the maintenance products industry.

Structure of the sector

It is difficult to say exactly how many firms and employees are involved in the maintenance products industry. Firstly, many of these firms operate not only in the maintenance products sector but also in other sectors linked to consumer products. Secondly, the sector features a large number of small and medium-sized firms and the range of products is very wide, thus making the task of gathering statistical data difficult.

Nevertheless, in 1990, the number of firms involved in the production and marketing of maintenance products was put at 560, within the EC, including the newly unified

Germany. This figure includes large multinationals operating worldwide as well as a multitude of smaller firms supplying their national or sometimes even regional market.

The growing commercial competition from supermarkets which sell their own brands should be noted. Such products tend to be less expensive (generic products), either because the product is less concentrated, or because it is marketed in large quantities. They are normally produced by well-known firms.

Employment

The total number of people employed by the maintenance products sector within the EC remained relatively stable throughout the 1980s and in 1990 was estimated at 25,000. Due to improved productivity, the sector has been able to respond to the growth in demand without increasing the number of jobs.

Within the maintenance products industry, salaries and wages are generally higher than those in other sectors. The reason lies in the high level of training required.

Table 1
Size of the EC maintenance products industry

	1990
Number of companies	560
Number of employees	25 000
Turnover (million ECU)	3250

Source: FIFE

Whatever the area - research, testing, sales or production - the number of skilled jobs is higher than average; in addition, continuous training is required in order to keep up with innovations in the sector.

External trade

Due to the fact that it is highly competitive, the EC maintenance products industry is a net exporter in relation to the rest of the world. Nevertheless, the industry's cover rate (i.e. the ratio of extra-EC exports to extra-EC imports) has gradually decreased since 1984 from 5.2 to 3.4. These figures should be treated with caution however, as they include part of the insecticides and herbicides used in agriculture, products which come under the agrochemicals sector and which account for a significant share of the trade in maintenance products (somewhere in the region of 34%).

If one excludes insecticides and herbicides, the trends are basically identical: the EC's trade surplus in relation to the rest of the world stood at around 871 million ECU in 1989. Exports increased by 6% in 1989 after having stabilised in 1988. Imports increased by 11% in 1989 following an increase of 15.5% the previous year. Finally, the cover rate for imports/ex-

ports was in the region of 3.4% in 1989. A breakdown by product group shows that exports for groups other than disinfectants and household insecticides, deodorants and anti-parasite products grew in 1988 and 1989.

Intra-EC trade is on the increase; between 1986 and 1989, the total amount of maintenance products traded within the EC increased by nearly 17%.

Investment

The competition which governs this market, rapid changes in consumer tastes and new regulations mean that constant efforts are needed in terms of research and development, in order to retain market shares. Packaging and production processes are constantly being improved and altered. Overall, consumer safety and environmental considerations are determining factors when it comes to developing products; the packaging and labelling must ensure that the product is both easy and safe to use. Recently, major efforts have been made to develop new types of propellant for aerosols and containers which do not involve the use of pressure. In addition, companies have sought to standardise containers and widely adopted packaging which conforms to EC standards.

The introduction of solutions thickened with hypochlorite, which greatly enhances the performance of such products, is one example of this trend. The Hypochlorite Commission is another. The latter inspects approximately 1 million tonnes of products per year, products which ensure basic, highly effective protection of public health at a lower price. The Commission is aware that in a very small number of cases, incorrect use of hypochlorite can pose a risk. This can occur when hypochlorite products are mixed with other acidic cleaners and used simultaneously. The Hypochlorite Commission has firmly encouraged better labelling aimed at preventing incorrect use. At the same time, it supported a public information campaign stressing the advantages and high safety levels of hypochlorite products, when used correctly.

Prospects

The maintenance products industry supplies virtually all retail groups which market products under their own trademark, providing them with advice and instructions as well as production and packaging facilities. Owing to the diverse range of products manufactured in this sector, it is difficult to paint an overall picture. Any re-

Table 2
Maintenance products
EC trade in current value (1)

(million ECU)	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989
Exports extra-EC	641	813	891	1 067	1 304	1 446	1 357	1 163	1 157	1 227
Index (2)	46	57	62	75	90	100	92	80	80	85
Imports extra-EC	115	166	196	216	253	323	289	267	316	356
Index (2)	40	54	63	70	78	100	89	83	98	110
X/M	5.6	4.9	4.5	4.9	5.2	4.5	4.7	4.4	3.7	3.4
Trade intra-EC	505	601	675	808	1 031	1 084	1 050	1 023	1 090	1 261
Index (2)	52	60	67	80	95	100	97	94	101	116
Share of total (%)	41	40	40	41	44	44	43	47	49	52

(1) Reporting countries - 1980 EC9; 1981-83 EC10
Partner country - extra / intra EC12. Greece estimated.
(2) Taking into account changes in EC membership
Source: Eurostat (Comext)

duction in the use of maintenance products seems unlikely however, given their integral role in numerous aspects of daily life. Such products are therefore less susceptible than most to the vagaries of the economic climate. The market is expected to stabilise somewhat, with an average

growth rate slightly below that of the GNP. Growth rates will vary however, from one country to the next; the southern Member States, where maintenance products are less widely used, should offer more promising prospects for growth.

FIFE: International Association of the Cleaning and Maintenance Products Industry.
Address: Square Marie-Louise 49,
B-1040 Brussels; tel: (32 2) 230.83.71; fax: (32 2) 236 82.88.
Revised by: DRI Europe

The pharmaceutical industry in the EC has reported a positive trade balance with the rest of the world over the 1980s. However, it is currently faced with a number of problems which jeopardise the future health of the sector. These include the high cost (current estimates of which range from 105 to 200 million ECU in 1989) of developing and bringing to the market a product or a new chemical entity (NCE); the period of exclusivity granted under existing patent protection legislation; the varying degree of state involvement in Member States social security systems; the favourable treatment granted to certain generics manufacturers and increasing competition from the US and Japan which are generally able to operate in a freer domestic environment. The end of the decade also saw the emergence of groupings of major companies through mergers and acquisitions, not just in Europe, but worldwide.

The sector is therefore undergoing profound change to adapt to the 1992 deadline, but is also gearing up worldwide to meet the challenges presented by new technological developments (biotechnology), politics (upheaval in Eastern Europe), economics (emergence of new competitors) and demography (ageing population).

Definition of the sector

Within the EC, the first Article of Directive 65/65 defines medicinal products as shown in table 2.

It is not easy to translate the concept of medicinal products into economic terms.

Until recently, each Member State had its own classification.

To avoid confusion, the sector has adopted, as reasonably representative, a grouping of data based on the Standard International Trade Classification (SITC), heading 54 of the OECD, i.e. the entire "medicines" section, as well as the sections covering specific active substances.

The key figures are based on this defini-

Table 1
Pharmaceuticals
Main Indicators, 1980-90 (1)

(million ECU)	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990 (4)
Apparent consumption (2)	15 352	17 316	19 382	21 438	23 350	26 495	34 078	38 368	41 845	43 947	46 681
Net exports	1 797	2 044	2 250	2 470	2 842	3 129	3 697	3 835	3 969	4 153	3 819
Production (3)	18 601	21 199	24 234	26 585	28 952	32 397	37 775	40 407	45 814	48 100	50500
Employment (thousands) (3)	389	397	397	395	398	400	400	443	445	445	447

(1) Figures based on SITC 54
(2) Excluding Spain. 1980 estimated
(3) 1989 estimated.
(4) Estimated
Source: EFPIA

tion. Missing data have been completed, wherever possible, with Eurostat data drawn from a NACE 257 base.

The data reported here are approximate and should be considered as trend indicators, providing an acceptable basis for comparison.

Current situation

The pharmaceutical industry is represented

in every Member State of the Community with the exception of Luxembourg (only imports). However, the various stages of the production of pharmaceuticals are implemented in different ways as a function of the company in question.

The combined production of pharmaceutical companies operating in the Community market more than doubled between

1980 and 1989 from 19 billion ECU to 48 billion ECU.

The EC is currently the leading world location for production and export of pharmaceuticals with an external trade surplus of about 3.9 billion ECU in 1990. Moreover, intra-Community trade is growing fast, and was worth 6.1 billion ECU in 1989, 3 times greater than in 1980.

The EC pharmaceutical industry continues to invest close to 5 billion ECU each year in research. However, its position is precarious. Domestically it faces problems of various regulatory environments, pricing policy and patent laws which differ from country to country in the EC (see below for more details). Internationally it faces strong competition from the United States and Japan.

The pharmaceutical industry employs around 450 000 persons in the EC, more than 10% of whom are involved in research.

Production industry and industry structure

Production is very diversified as it meets specific and very diverse demand. It varies in its degree of integration (from the synthesis of basic chemical entities to the preparation of finished products) as well as in the type of dosage formulation produced, (from the most widely used solid formulation, ie, tablets, pills, etc..., to

Table 2
Pharmaceuticals
Definitions and scope

Article 1 of EC directive 65/65

- Proprietary medicinal products
Any ready prepared medicinal product placed on the market under a special name and in a special pack.
- Medicinal product
Any substance or combination of substances presented for treating or preventing disease in human beings or animals. Any substance or combination of substance which may be administered to human beings or animals with a view to making a medical diagnosis or to restoring, correcting or modifying physiological functions in human beings or in animals is likewise considered a medicinal product.
- Any substance irrespective of origin. Such substance may be :
 - * human, e.g. human blood and human blood products
 - * animal, e.g. micro-organisms, whole animals, parts of organs, animals secretions, toxins, extracts, blood products
 - * vegetables, e.g. elements naturally occurring, chemical materials and chemical products obtained by chemical change or synthesis.

Source : OJ C 22. 9. 2. 1985

Table 3
Principal combined nomenclature codes for pharmaceuticals

29.35	sulphonamides
29.36	provitamins, vitamins
29.37	hormones
29.38	glycosides
29.39	alkaloids
29.41	antibiotics
30.01	glands and substances for prophylactic uses
30.02	vaccines and sera
30.03	medicaments

Source : Eurostat

Table 4
Pharmaceuticals - Production and Investment

(million ECU)	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990 ⁽⁴⁾
Production in current prices											
EC	18 601.0	21 199.0	24 234.0	26 585.0	28 952.0	32 397.0	37 775.0	40 407.0	45 814.0	48100	50500
Index	57.0	65.0	75.0	82.0	89.0	100.0	117.0	125.0	141.0	148.0	156.0
USA ⁽¹⁾	14 273.0	19 987.0	25 207.0	30 791.0	36 704.0	41 058.0	34 915.0	32 722.0		N/A	N/A
Index	35.0	49.0	61.0	75.0	89.0	100.0	85.0	80.0	N/A	N/A	N/A
Japan ⁽¹⁾	9 181.0	12 755.0	13 977.0	17 234.0	19 574.0	21 115.0	20 831.0	24 141.0		N/A	N/A
Index	43.0	60.0	66.0	82.0	93.0	100.0	99.0	114.0	N/A	N/A	N/A
Productivity ⁽²⁾											
Index	4 781.7	5 339.8	6 104.3	6 730.4	7 274.4	8 099.3	9 443.8	9 121.2	10 295.3	N/A	N/A
	59.0	65.9	75.4	83.1	89.8	100.0	116.6	112.6	127.1	N/A	N/A
Investment in current value ⁽³⁾											
Index	927.0	1 072.0	1 313.0	1 384.0	1 504.0	1 764.0	1 704.0	2 378.0	2 489.0	N/A	N/A
	52.6	60.8	74.4	78.5	85.3	100.0	96.6	134.8	141.1	N/A	N/A

⁽¹⁾ Census of Manufactures and Eurostat estimates

⁽²⁾ Productivity=Production in current value/Employment

⁽³⁾ Excluding Ireland and Portugal; 1983, 1985, 1986, 1987 and 1988 are estimates.

⁽⁴⁾ Estimated

Source: EFPIA, Eurostat (Index)

specific formulations for particular therapeutic activities, ie, injectable ampoules, capsules, etc...).

Production must meet the demand for both widely prescribed medicines for the treatment of common illnesses, as well as for medicinal products to treat certain rare conditions, of which only a few hundred cases may have been diagnosed in Europe. In all cases the legislative framework is the same, production standards are very strict and high quality is essential.

EC production has increased steadily from 19 billion ECU in 1980 to 48 billion ECU in 1989 to meet the demand of the world market, with the European industry active in scientific and technical research.

EC production is higher than USA and Japan production (respectively 1.2 and 1.7 times higher in 1987).

Three EC companies are among the ten worldwide pharmaceutical leaders: Glaxo (UK), Hoechst and Bayer (D). Smith Kline-Beecham resulting from the merger of Beecham (UK) and Smithkline Beckman (USA) can be added to this group.

From the remaining six, two are Swiss and four US.

The recent merger of Rhône-Poulenc (F)

and Rorer (USA) has modified the ranking, Rhône-Poulenc-Rorer reaching now the fifth position.

Within Western Europe, the ten leading companies are from United Kingdom (Glaxo, Wellcome, ICI, Beecham), Germany (Hoechst, Bayer) and France (Rhône-Poulenc).

Strong competition exists both in Europe and worldwide, and no single company has a dominant position; the 10 largest companies in the world represent only 25% of the world market.

However, in order to face new challenges in terms of R&D costs, increasing competition and markets diversity, new groupings of major companies have emerged through mergers and acquisitions:

- ❖ merger between SmithKline (USA) and Beecham (UK) giving Smithkline-Beecham;
- ❖ merger between Bristol Myers (USA) and Squibb (USA) giving Bristol Myers-Squibb;
- ❖ acquisition of Rorer (USA) by Rhône Poulenc (France);
- ❖ more recently announcement of the joint venture between Du Pont (the largest chemical company in the US) and Merck (the largest pharmaceutical company in the world) named Du Pont-Merck Pharma-

ceuticals (DPMP).

Research

Medicinal products depend heavily on research for progress.

In 1988, the EC pharmaceutical industry invested close to 5 billion ECU in research. This represents nearly 15% of its turnover and one of the highest research/turnover ratios in industry. Depending on the size of the national industries, investment varies between 3.5% and 24.6%. Research is carried out principally in Germany, France, Italy and the United Kingdom, and to a lesser extent in Belgium, Denmark, the Netherlands and Spain.

As a result of this investment, seven European companies (six of EC origin) rank among the leading 10 worldwide in terms of nominal R&D spending. However, if companies are ranked according to profitability, only 2 European companies are in the top 10.

As can be seen in Figure 1 and 2, European research is still the most productive, but results achieved by Japan in particular (which achieves a better rate of innovation than the USA for the period 1986-89) demonstrate that a redoubling of effort is required and that more investment is essential.

Table 6
The leading pharmaceutical companies in Western Europe (1988)

Companies	Countries	Turnover (million ECU)
Glaxo	United Kingdom	3 945
Hoechst	BR Deutschland	3 343
Bayer	BR Deutschland	3 136
Ciba-Geigy	Switzerland	2 935
Sandoz	Switzerland	2 516
Hoffman-La Roche	Switzerland	2 003
Wellcome	United Kingdom	1 926
Rhône-Poulenc	France	1 915
ICI	United Kingdom	1 805
Beecham	United Kingdom	1 791
Boehringer-Ingelheim	BR Deutschland	1 675
Schering	BR Deutschland	1 263
Montedison	Italia	1 194
Akzo	Nederland	1 025
Sanofi	France	950

Source : Chimie Actualité, 1989

The diversity of research fields has required companies to specialise in certain research areas, and in the production of corresponding medicinal products. In addition to research costs (essentially for personnel), other necessary investments (well over 2.4 billion ECU in 1988 as shown in table 4) are of sufficient size to reinforce the need for specialisation. However, this is a changing market and no single company or product is protected from the arrival on the market of a competitor with a more innovative therapeutic profile.

Another problem area is the long development time of a product.

It takes over 10 years from the time a pat-

ent is applied for until marketing authorization is obtained.

This process uses up more than half the patent protection period granted to the innovator.

EC companies are therefore left with too short an exclusivity period to ensure profitability of their investment in R&D before the possible appearance on the market of very price-competitive imitations. By comparison, American and Japanese companies have been granted an extension of the patent-protection period by their respective governments.

This is why in April 1990 the EC Commission tabled a proposal for a Council Regulation COM (90) 101 final "to improve

the protection of innovation in the pharmaceutical sector" and guarantee "laboratories working to develop new medicinal products at a level of protection equal to that enjoyed by research in other sectors".

Consumption

In 1988, the EC consumption was around 33 billion ECU (at manufacturer's selling price).

A patient can obtain medicine either through a medical prescription - and in this case he will probably (but not necessarily) be reimbursed by his social security system - or without a prescription in which case he pays the full price if he wishes to obtain a product for minor indications.

There are also products available over the counter (OTC), which are marketed directly to the public.

Medication costs account for about 16% of total health care costs in the EC.

For products dispensed on the basis of a prescription, reimbursement mechanisms differ in the 12 Member States.

Apart from varying reimbursement systems, the EC also has 12 different price-structure systems, which are summarised below:

For a price to the public of 100 units:

- ❖ the manufacturer receives between 49 and 70 units;
- ❖ the distributing wholesaler between 6 and 13 units;
- ❖ the dispensing pharmacist between 22 and 38 units;
- ❖ the State, through VAT, between 0 and 25 units.

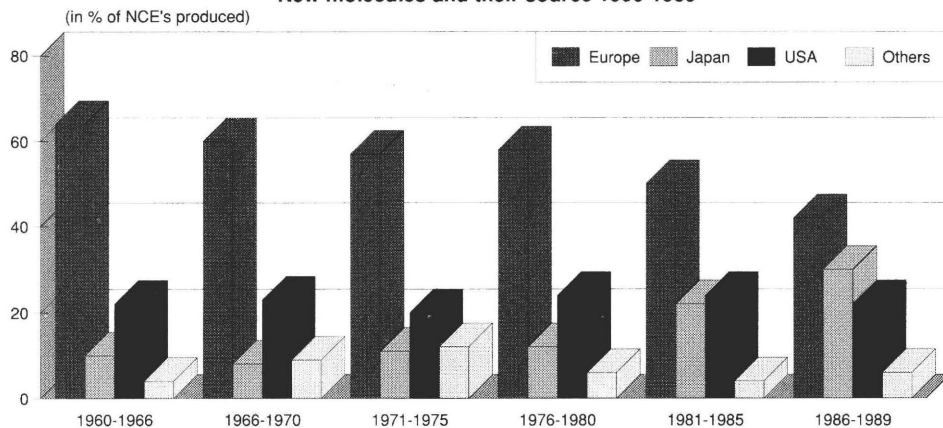
(NB: in view of the uniqueness of the UK system, this country was not included in this survey).

Table 5
The leading pharmaceutical companies in the world

Companies	Countries	Turnover (1) (billion US\$)
Merck	USA	4.5
Squibb-Bristol	USA	3.8
Glaxo	United Kingdom	3.5
Smithkline-Beecham	USA-United King.	3.3
Ciba-Geigy	Switzerland	3.2
Hoechst	BR Deutschland	2.7
Bayer	BR Deutschland	2.5
Johnson & Johnson	USA	2.5
American Home Products	USA	2.4
Sandoz	Switzerland	2.3

(1) one year cumulated turnover ending in September 1989
Source : Rhône-Poulenc mid-1990

Figure 1
Pharmaceuticals
New molecules and their source 1960-1989



Source: REIS-ARNDT, "Drugs in Germany" 30/03/1987 and information in "Scrip" for 1986-1989.

Employment and productivity

The EC pharmaceutical industry has a workforce of approximately 450 000 and, in general, employment is slightly decreasing. However, indirect employment generated upstream and downstream should be taken into account. It has been calculated that the pharmaceutical industry generates employment for a total of 1.2 million people throughout the EC.

In addition to employment stability, the workforce covers a wide range of skills within companies.

University graduates account for 20% of these. Women represent, on average, 30% of the total workforce, and up to 50% in certain manufacturing countries.

Productivity has been increasing by an average growth rate of 10% since 1980 reaching a level in 1988, of more than 10 billion ECU by employee (see table 4).

Trade

The trade balance has been positive since the beginning of the decade, and has doubled in the last eight years reaching around 4 billion ECU in 1988.

However, export growth is showing signs

of slowing, and despite a clear improvement in 1987, imports are still increasing faster than exports.

This is reflected in the export/import ratio, which has dropped from 2.38 in 1981 to 2.08 in 1988.

The intra-EC trade also has grown fast and was valued at 6.4 billion ECU in 1989, 3.5 times greater than in 1980. The world market for pharmaceutical products has evolved, as shown in Table 9, growing by 20% in ECU from 1984 to 1989. This rapid expansion provides good opportunities for export growth.

Outlook

Western Europe as a whole represents one of the largest potential markets in the world. However, unlike in the USA and Japan, the existing structures do not allow it to benefit from a market free from internal barriers. Even the EC market effectively consists of 12 separate markets as opposed to one large market.

In view of Japan's increasing share of the world market, the prospects of growth for Europe-based producers are less favourable.

In addition, the EC's pharmaceutical industry must cope with a series of specific un-

Table 7
Pharmaceuticales
Share of medicines in total health care costs, 1988

	(%)
Belgique/België	17.3
Danmark	13.1
BR Deutschland	15.3
España (°)	21.4
Hellas	31.3
France (°)	18.5
Ireland	8.8
Italia	16.7
Nederland	7.8
Portugal	19.5
United Kingdom (°)	12.9

(°) including blood products
(°) of public expenditures
(°) of NHS expenditures
Source: EFPIA

certainties which make forecasting difficult.

The trend appears to be one of slower growth: around 5% in 1989, slightly more than 3% in 1991 and 1992 (see table 10).

The challenges confronting the industry are formidable:

- rising research costs and the need to invest simultaneously in new fields such as biotechnology. For example, in the USA, 1987 R&D spending in this area was estimated at 1.7 billion ECU (2 billion US dollars), 69% of which was on health care.
- This is to be compared with the 5 billion ECU spent in the EC for R&D in the whole pharmaceutical sector;
- pressures on the industry in respect of cost containment by national authorities who are, for their part, interested in controlling healthcare budgets;
- erosion of protection afforded by existing patent legislation due to lengthy administrative procedures and the sophistication of control techniques in the industry;
- parallel to the erosion of effective patent life, the threat from lower-priced imitations to the detriment of innovative medicine.

The EC Commission, convinced of the importance of this issue to pharmaceutical industry research and competitiveness, has

Table 8
Pharmaceuticals - EC trade in current value (1)

(million ECU)	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990 (2)
Exports extra-EC (2)	3 013	3 527	3 953	4 497	5 174	5 772	6 967	7 057	7 640	8 803	8 800
Index (3)	N/A	61	68	78	90	100	120	123	132	147	152
Imports extra-EC (2)	1 216	1 483	1 703	2 027	2 332	2 643	3 270	3 222	3 671	4 350	4 981
Index (3)	N/A	56	64	77	88	100	123	122	139	165	188
X/M	N/A	2.38	2.32	2.22	2.22	2.18	2.13	2.19	2.08	1.94	1.76
Trade intra-EC	1 846.6	2 294.1	2 570.5	2 940.7	3 539.1	4 005.0	4 598.1	4 890.9	5 488.5	6 431.0	N/A
Index (3)	47.3	57.3	64.2	73.4	88.4	100.0	107.7	114.6	128.6	150.7	N/A
Share of total (%)	36.4	37.6	37.0	38.3	39.7	39.6	43.0	43.9	44.2	45.7	N/A

(1) Excluding Greece; figures cover SITC 54

(2) 1980 excluding Greece and Spain

(3) Taking into account changes in EC membership.

(*) Estimated

Source: EFPIA, Eurostat (Comext)

Table 9
Pharmaceuticals - Evolution of the world market, 1984-89 (1)

(million ECU)	1984 (%)	1985 (%)	1986 (%)	1987 (%)	1988 (%)	1989 (%)
World (1)	110 389 100	123 314 100	112 202 100	116 420 100	114 400 100	132 200 100
Europe	25 601 23	28 831 23	30 295 27	32 916 28	36 500 32	40 300 31
USA	30 704 28	34 663 28	29 723 26	28 778 25	32 500 29	40 400 31
Japan	16 567 15	18 396 15	20 134 18	21 966 19	24 400 21	28 100 21

(1) World total excludes Eastern Europe

Source: US estimates

prepared a proposal for the restoration of a patent term;

- strong competition from the principal US and Japanese competitors who already benefit from a large internal market and are looking for expansion;
- increased competition in term of technology and innovation;
- recent upheaval in Eastern Europe.

Internationally, the outlook is good since demand is likely to grow. The increase in population and especially of the proportion of elderly people in industrialised countries will necessitate a greater number of therapeutic agents and methods.

It appears that operating in a complex, domestic and internationally competitive environment, the EC pharmaceutical industry faces an uncertain future. Its innovative and technical capacity is well established, but the investment necessary for healthy growth is essential.

Table 10
Pharmaceutical production forecast (at 1989 prices)

(million ECU)	1989	1990	1991/90	1992/91
Production	48 100	50 500	+3.5%	+3.2%

Source : EFPIA and Sema Group Management Consultants

In short, a balanced and global solution must be sought within the EC to compete successfully and in line with the Commission's views, as expressed in the Explanatory Memorandum to Document COM (86) 765 final (which became the so-called 'transparency' Directive 89/105).

"The aims of Community policy must be to ensure that such measures (ie, those taken by national authorities to control the cost of medicines and social security) do not adversely affect the operation of the internal market and take due account of the need to maintain a high level of public health within the Community will to a large extent depend on the activities of the Community's own pharmaceutical industry"

The industry is represented at the EC level by:
EFPIA: European Federation of
Pharmaceutical Industries Associations/
Fédération Européenne des Associations de
l'Industrie Pharmaceutique.
Address: Avenue Louise 250, Box 91,
B-1050 Brussels;
tel: (32 2) 640 68.15; fax: (32 2) 647 60.49
Reviewed by: Sema Group Management
Consultants

In 1989 EC consumers spent around 7.4 billion ECU on OTC (over the counter) pharmaceutical products. This represents approximately one third of the total pharmaceutical market. The promotion of self-administered medication and growing public awareness of health problems should enable the industry to expand moderately by around 5% per annum in the years to come. The situation varies widely from country to country: regulations governing prescriptions and health care funding systems take different forms, as do the procedures for recording statistics and national policies on issues such as advertising and prices. The broader harmonisation of legislation should help the sector to take full advantage of the current favourable tendency.

Description of the sector

The OTC pharmaceutical products industry supplies medical products which can be purchased directly by the consumer without a doctor's prescription. The products are generally used for non-malignant disorders. Over-the-counter buying is regarded as perfectly acceptable in certain circumstances because it:

- ❖ reduces the financial burden on the state health care system;
- ❖ reduces the volume of work by doctors called on to deal with health problems which require no medical treatment;
- ❖ promotes personal responsibility on issues that affect an individual's own health.

OTC products do not have the same status in all the members of the EC, and this report only relates to products which

are medicines as defined by the laws on medicaments of the various countries.

Similarly it is necessary to study both the potential of the complete OTC sub-sector (i.e. turnover of all medicines available without a prescription) and of true self-medication (or turnover of OTC products) in order to describe this sector of industry as accurately as possible.

Current situation

The size of the market for OTC pharmaceutical products in the EC is not easy to gauge: the laws governing prescriptions, the funding systems and the outlets where OTC products are sold vary considerably from country to country. The same product may be sold on prescription in one country and may be an OTC product in another. It may be sold exclusively by chemists, drug-stores or in food stores, a fact that makes

Table 1
Non-prescription pharmaceuticals
Turnover in OTC products and share of OTC products in the
total pharmaceutical market

	Turnover (million ECU)			Share of total market (%)		
	1987	1988	1989	1987	1988	1989
Belgique/België	500	500	460	30	29	30
BR Deutschland	4 700	5 100	5 480	37	36	36
España	450	500	550	15	13	13
France	3 700	4 100	4 220	35	35	35
Italia	900	900	990	13	11	10
Nederland (*)	707	714	798	30	28	25
United Kingdom	900	1 000	1 090	22	22	22

Source: Institute for Medicinal Statistics, 1990

statistical data difficult to collate. There are also numerous products that can be sold without prescription but which are subsidised if they are prescribed by a doctor. The market in medicaments available without prescription was estimated to be 13.7 billion ECU in 1989, an increase of approximately 6% compared with 1988. It represents around one third of the total pharmaceutical market. It corresponds to the potential subsection of OTCs (turnover of all medicines not subject to prescription) of which over 50% is nevertheless prescribed by doctors. This evaluation is based on the price to the consumer and was carried out by the AESGP in association with the Institute of Medical Statistics (IMS). Around 7.4 billion ECU is currently spent by EC consumers on medicines available

without a doctor's prescription. The importance of medicaments sold for self-administered medication varies greatly from country to country. While there is virtually no use at all of non-prescribed drugs in Greece for instance, officially at least, and while this practice is relatively rare in the southern members of the EC like Italy, Spain and Portugal, it is a well established practice in countries like France, the Federal Republic of Germany and the United Kingdom. Table 1 shows the turnover in OTC medicines in the seven principal markets for 1987, 1988 and 1989. Table 2 gives the total turnover in true self-medication. Germany and France together represent 71% of the turnover in products available without prescription and 66% of the turn-

over in self-medication products. Nevertheless the turnover - like the market share - does not always apply to the same range of products with the same promotional potential. In France for instance, approximately one half only of the total turnover in self-medication is actually accounted for by drugs which are advertised; the other half consists of subsidised medicines for which advertising is not permitted. These products are subject to price controls but may not appear in advertising. In other countries nearly all non-prescribed medicines are advertised and bought by the consumers themselves. The importance of the main groups of products in these seven countries is indicated in table 3. Remedies for coughs and colds as well as analgesics dominate the sector. Since this definition was not applied to statistical data on the market for non-prescribed products until 1987, the growth in the total market for this type of drug and the percentage of true self-medication cannot be established without causing some confusion. Up till now the IMS has scarcely been able to record the pharmaceutical turnover as a whole, let alone statistics for OTC products and self-administered medicines, and this is why past estimates cannot be directly linked to

Table 2
Non-prescription pharmaceuticals
Turnover in self-medication products and their share of the total pharmaceutical market

(million ECU)	Turnover market (%)			Share of total		
	1987	1988	1989	1987	1988	1989
Belgique/België	300	300	280	18	18	18
BR Deutschland	2 200	2 300	2 430	16	16	16
España	400	400	470	12	11	11
France	2 000	2 200	2 420	19	19	20
Italia	800	800	890	11	9	9
Nederland	115	118	139	8	7	8
United Kingdom	500	600	690	14	13	14

Source: Institute for Medicinal Statistics, 1990

Table 3
Non-prescription pharmaceuticals
Turnover in the principal self-medication
products (official price), 1989

(million ECU)	Turnover
Group of products	
Remedies for colds and coughs	1 290
Analgesics	1 200
Digestives and stomach medicines	840
Skin treatments	790
Vitamins and mineral supplements	700

Source: Institute for Medicinal Statistics, 1990

figures for 1987-1989 since the method by which these data are gathered has been changed. Nevertheless it is possible to show that there are substantial variations in developments in medicines without prescription and of self-medication within the various countries of the European Community. Here are some examples:

- ❖ the principal categories of OTC: in nearly every European country, remedies for coughs and colds and painkillers are the principal preparations that are not subject to prescription. However tonics, as an example, are far more important in the Federal Republic of Germany than they are in most other member countries, whilst vitamins and mineral supplements are especially significant in the Netherlands;
- ❖ the approach to the issue of health care funding: this leads to widely varying cost control measures and hence to different systems of financing. Since this in turn affects encouragement to practice self-medication, the uneven development of this sector of industry is easy to appreciate.

In addition, both parliamentarians and public health civil servants in the various countries of the EC have realised the immense contribution which self-medication can make to the funding of sickness insurance systems. In the Federal Republic of Germany for example, it is estimated that self-medication cuts state sickness insurance expenditure by at least 1 billion ECU.

Structure of the industry

OTC products are manufactured both by large pharmaceutical conglomerates which also make prescription medicines and by certain more specialised companies. Both reflect similar tendencies towards restructuring and regrouping.

Activity in the areas of mergers, takeovers and alliances between groups has continued to gather pace over the past three years and affect the market for prescription medicaments as much as the OTC sub-sector:

- ❖ the recent "marriage" between the Sanofi and Sterling companies, subsidiaries of the French Elf and the American Kodak corporations respectively and which are responsible for their prescription and OTC medicines both in Europe and in the United States (respective turnovers were 1.8 and 0.5 billion ECU in 1990);
- ❖ alliances established in 1990 between the American groups Merck and Dupont on the one hand and the French company Rhône-Poulenc and the American Rorer on the other. Rhône Poulenc/Rorer have also acquired a holding in the Canadian Connaught;
- ❖ "megamergers" of the pharmaceutical groups Bristol Myers-Squibb (American), Smithkline-Beecham (Anglo-American) and Merrell Dow-Marson (American) in 1989. Bristol Myers-Squibb, the number two in world pharmaceuticals, have just acquired a 33.5% holding in the French Upsa Laboratories.

At both European and world level certain pharmaceutical groups are specializing and strengthening their position on the OTC market. These include:

- ❖ Sanofi, Ciba Geigy in Europe;
- ❖ Schering Plough, through their new company Schering Plough Healthcare Products (annual turnover 0.5 billion ECU), and Johnson & Johnson / Merck Consumer Pharmaceuticals, a joint venture created in 1990 in the United States.

Other pharmaceutical groups are in the process of departing from the OTC scene:

this was the recent case of the ICI group selling its OTC interests in the EC and USA.

Legal context

In most cases and in most countries, the registration of OTC products is identical or similar to the system used for registering products which are subject to prescription. Currently this system is applied in each country for each product, which is not only a waste of time but also constitutes the main legislative barrier to the free circulation of products, since manufacturers obtain separate marketing licences for each individual country. However firms are able to request Community coordination of the national registration decisions under the "multi-state" procedure created by EC directive 83/570/EC.

Since trends in self-administered medication vary from one country to another, it is essential to be able to develop a system of reciprocal recognition facilitating the supply of any product considered sufficiently safe and efficacious in one country of the Community to any of the other countries.

Prices Retail and wholesale prices vary widely from one country to another in Europe and are sometimes exempt from value added tax on OTC medicines, as in Portugal. The control of prices for OTC medicines and for prescription medicaments is legitimate according to the EC Commission. Nevertheless the Commission has also stressed the fact that normal competitive prices must be applied since the consumer is able to choose directly the product which represents for him the best value (after consulting his chemist if necessary).

It would now seem appropriate to abolish the controls applied to these products, in

Table 4
Non-prescription pharmaceuticals
Recent acquisitions

Buyer	Company sold	Vendor	Annual Sales of company / division sold (million ECU)
Boots	ACF Roterfarma (Netherlands)	ACF Holding (Netherlands)	-7
Ciba Geigy (Switzerland)	OTC divisions of ICI in the UK and Ireland (Care Lab.)	ICI (UK)	-10
Johnson & Johnson Merck Consumer Pharmaceuticals (United States)	OTC division of ICI in the USA	ICI (UK)	-107
Rhône-Poulenc Santé (France)	Auspharm International (Australia)		-7

Source: Sema Group Management Consultants

which case the Member countries would always be able to impose a freeze on their prices in so far as such a freeze would also relate to other sectors of the economy and form part of a global strategy aimed at curbing inflation.

This is a view shared by the majority of EC countries and is an essential element in the future development of the OTC industry.

Outlook

As a large number of over the counter preparations are subsidised at least to some extent by the health insurance systems, incentives aimed at increasing self-medication are somewhat restricted. However a number of studies including the WHO study "Self-Medication in Europe", published by the regional office of the WHO for Europe in 1988, indicate growing

awareness on the part of the public of self-administered drugs and a heightened willingness by people to take responsibility for their health without the use of treatments prescribed by a professional consultant. As a result, the prospects for this sector can be regarded as positive. The industry forecasts an annual growth rate in turnover of approximately 5% over the next few years, that is 14.4 billion ECU in 1990 (constant prices 1989), but with considerable variations from country to country and from one category of drugs to another, such as:

- ❖ Vitamins and tonic products: most EC countries are experiencing a healthy growth, especially in the field of "multivitamins", where sales exceed those of vitamin C;
- ❖ Pregnancy testing kits: this market is constantly expanding bearing in mind the arrival of new types of tests that are more sophisticated and safer to use;
- ❖ Cold treatments: numerous innovations in terms of new drugs and new presentations (capsules, liquids, pills, etc), are giving new impetus to the market, unlike nasal sprays which are experiencing less success in some European countries.

We also note the general appeal of prophylactic self-medication drugs and diagnostic products available without prescription. This trend goes hand in hand with an increase in many countries in vitamin and mineral supplements. These two tendencies should continue. On a less hopeful note, those groups of products that have enjoyed a relatively buoyant turnover for many years (for example painkillers, medicines for coughs and colds) are tending to stagnate and will not make much recovery in a number of countries. However

Table 5
Non-prescription pharmaceuticals
The 20 main world pharmaceutical groups on the medicaments market (*)

Company (nationality)	Classification	Turnover 1989 (billion ECU)
Merck (USA)	1	4
Bristol Myers-Squibb (USA)	2	3.5
Glaxo (United Kingdom)	3	3.1
Smithkline Beecham (USA - United Kingdom)	4	3
Ciba-Geigy (Switzerland)	5	2.9
American Home Products (USA)	6	2.7
Hoechst (BR Deutschland)	7	2.5
Johnson & Johnson (USA)	8	2.3
Bayer (BR Deutschland)	9	2.3
Sandoz (Switzerland)	10	2.1
Lilly (USA)	11	2.1
Pfizer (USA)	12	2.1
Rhône-Poulenc-Rorer (France - USA)	13	2
Roche (Switzerland)	14	1.9
Schering Plough (USA)	15	1.6
Marion Merrell Dow (USA)	16	1.6
Upjohn (USA)	17	1.5
Sanofi-Sterling (France, USA)	18	1.5
Boehringer (BR Deutschland)	19	1.5
Warner Lambert (USA)	20	1.4

(*) Classification based on sales by prescription
Source: Sema Group Management Consultants

this will mainly affect those countries which already show a substantial turnover in self-administered drugs and to a lesser extent countries where self-medication is on the increase and where groups of products not subject to prescription such as medicines for coughs and colds, and pain-killers, should strengthen their position to a more significant degree.

Nevertheless as with the pharmaceutical industry as a whole, the future expansion of manufacturers of OTC products also depends to a large degree on the regulatory context of the Single European Market in 1992 and after.

The new proposals relating to a future system of marketing licences (French Official Journal No. C 330 dated 31.12.90) should encourage the reciprocal recognition of OTC products among member countries. Elsewhere the Commission has also proposed the harmonisation of the classification criteria of the drugs which are available with and without a prescription

Table 6
Non-prescription pharmaceuticals
Breakdown of the price of a popular OTC drug in the major members of the EC, (index)

Country	Wholesale B.T.	B.T. (*)	A.T. (*)
Belgique/België	123	200	212
BR Deutschland	130-168	146-203	166-232
España	114	162	172
France	111	166	178
Italia	112	149	164
Nederland	124	184	222
Portugal	110	139	139
United Kingdom	114	171	197

(*) B.T. = before tax

(*) A.T. = after tax

Source: AESGP

(French Official Journal No. C 58 dated 8.3.90) as well as the ways in which pharmaceutical advertising is controlled (French Official Journal No. C 163 dated 4.7.90, p.10) which should help to establish a Community-wide system applicable to OTC medicines.

Written by: Sema Group Management

Consultants

The industry is represented at EC level by:

AESGP: Association européenne des spécialités pharmaceutiques grand public.

Address: 7, avenue de Tervuren, B-1040

Brussels; tel: (32 2) 735.51.30; fax: (32 2)

735.52.22.

Following a particularly bleak period throughout the 1980s, brought about by the crisis in the textile industry and growing competition from newly industrialised countries, the major European producers of chemical fibres are finally reaping the rewards of their restructuring programme. The European chemical fibres industry is turning its attention to higher-value-added products, while pursuing a dynamic investment policy aimed mainly at rationalisation and research and development. Competition remains keen however, and 1989 saw a marked slowdown in the growth of world demand. European industry is expected to show a low level of growth in the early 1990s; the prospects will largely depend on EC decisions.

Description of the sector

Chemical fibres are either synthetic fibres (chemical polymers which are synthesised using hydrocarbons), or man-made fibres derived from natural sources, mainly cellulose. There is also a third type of chemical fibre: mineral fibres derived from glass, for example. These fibres are not normally included in the textiles sector and have therefore been excluded from the statistics. The main synthetic fibres are polyester, polyamide (nylon) and acrylic. Polypropylene fibres are also becoming increasingly common. Cellulose-based fibres include acetates, rayon, rayon staple fibre and viscose. All of these fibres are divided up into sub-categories according to their physical form. Filament is a continuous polymer which is remilled in its molten

state via a fine strainer, then solidified by cooling. It is then spun in a variety of ways, depending on how it is to be sold. It can be cut up into short fibres for use in the manufacture of fabric using traditional machines designed for natural fibres. These short fibres often have very similar characteristics to those of natural fibres.

In 1989, consumption of chemical fibres accounted for 64% of total fibre consumption within the EC. These fibres are primarily used in the clothing industry (49% of total consumption), fabric for interior furnishings and industrial applications (34% and 17% respectively of total consumption). As a result, the industry's development is largely influenced by the performance of the textile and clothing industries.

Table 1
Man-made fibres
Main indicators, 1980-90

(Thousand tonnes)	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990
Visible consumption (1)	N/A	2 492	2 388	2 430	2 659	2 745	2 839	2 860	2 957	3 226	3 288
Net exports (1)	N/A	260	126	206	197	172	44	64	1	- 150	- 169
Production	2 585	2 752	2 514	2 636	2 856	2 917	2 883	2 924	2 958	3 076	3 119
Number of people employed (2) (in thousands)	114	99	93	87	85	81	77	75	74	71	N/A

(1) 1981-83 EC 10; 1989-90: Estimates

(2) 1988-89 Estimates

Source: CIRFS, Eurostat (Comext)

EC production of chemical fibres mainly consists of synthetic fibres which account for 85.6% of production, 53.1% in the form of short fibres and 32.5% in the form of filaments. Man-made fibres, in the form of filaments or short fibres, account for a mere 14.4%. This preponderance of synthetic products over man-made fibres is becoming more pronounced.

Current situation

The largest EC producers of chemical fibres are:

- ❖ Hoechst, AG (Germany): its turnover in chemical fibres amounted to 3 billion ECU in 1989;
 - ❖ Akzo Fibres and Polymers Division (Netherlands): 2.2 billion ECU;
 - ❖ Rhône-Poulenc Fibres, S.A. (France): 1.6 billion ECU;
 - ❖ ICI Fibres Ltd (United Kingdom): 1.05 billion ECU;
 - ❖ Courtaulds Fibres Ltd (United Kingdom): 0.67 billion ECU;
- followed by Enimont SpA (Italy), SNIA Fibre SpA (Italy), Bayer AG (Germany).

With a production capacity of 1 million tonnes, Hoechst is the largest world producer of polyester. It is currently seeking to extend its operations in the Iberian peninsula with the purchase of Finicisa Fibras Sintéticos in Portugal and Brilen in Spain in March 1990. ICI is the leading European producer of polyamide (nylon). The main foreign producers such as the American firm Du Pont De Nemours, the world's leading nylon manufacturer, and the Japanese firm Asahi, also operate in Europe.

The EC chemical fibres industry has undergone extensive restructuring since the late 1970s. Among the prime motives for this restructuring were the low increase in European textile consumption during the 1970s, following the oil crisis in 1973, the growing deficit on the EC's textile and clothing trade balance and the development of chemical fibre production capabilities in the rest of the world. Other reasons included the numerous investments made by EC firms in other parts of the world, par-

ticularly the developing countries.

After reducing its production capacity by 220,000 tonnes over the period 1978 - 1981, the chemical fibres industry embarked upon a second programme aimed at reducing capacity in 1981, since the sector was continuing to suffer major losses. The aim was a further reduction in capacity of over 500,000 tonnes, i.e. 18% of the total capacity installed. For a number of countries, this entailed a much larger reduction than average: the United Kingdom, for example, shed 51% of its synthetic fibre production capacity, i.e. 316,000 tonnes, between 1977 and 1986. Germany lost 269,000 tonnes, i.e. 26% of the total. Italy, meanwhile, lost only 11%, i.e. 66,000 tonnes. As regards employment levels, the United Kingdom has suffered the most: 76% of workers in the synthetic fibres industry lost their jobs between 1975 and 1985. Whereas the initial operation resulted in a more or less linear reduction in production capacities, the second was supposed to enable firms to

Table 4
Man-made fibres
EC production by product

(Thousand tonnes)	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989
Synthetic filaments	801	861	789	802	879	919	916	927	962	1 017
Short synthetic fibres	1 217	1 368	1 262	1 384	1 511	1 579	1 568	1 595	1 570	1 625
Filaments and short fibres										
Cellulosic fibres	567	523	463	450	466	419	399	402	426	434
Total	2 585	2 752	2 514	2 636	2 856	2 917	2 883	2 924	2 958	3 076

Source: CIRFS

shift their attention to specialist fibres.

Between 1978 and 1985, European companies reduced their production capacity by a total of one third (i.e. 900,000 tonnes). EC producers, however, now appear to be reaping the rewards of their efforts over the past twelve years or so. In 1989, the French firm Rhône-Poulenc saw its operational margin in the sector reach 37 million ECU whereas it barely balanced in 1988 and was negative in 1987. The Dutch firm Akzo has also noted a marked improvement: its trading result in fibres rose by 37.5% in 1989. At 110 million ECU, this margin now represents 5.2% of sales. Another cause of this relatively positive trend lies in the anti-dumping measures taken by the Commission of the European Communities against the major Asian producers, including Turkey. Thanks to such measures, EC manufacturers have managed to revive competition on their own market.

Production and consumption

In 1989, world production of chemical fibres increased by approximately 2.3%, reaching a record level of 19 million tonnes in what proved to be its seventh consecutive year of growth. This figure also tes-

tifies, however, to a slowdown in the growth of world production since the figure for 1988 had been 3.8%. As usual, synthetic fibres are the prime engine of growth: they increased by 2.6% in 1989 and now account for 82% of total production with 15.6 million tonnes. Production of man-made fibres has grown slightly less with an increase of 1.2%; it now stands at nearly 3.4 million tonnes, i.e. 18% of total production.

The industrialised nations have reported a low increase in production: production in Japan and Western Europe increased by a mere 1%, while American production dropped by 1%. At the same time, production in the less industrialised countries rose by 4% in 1989, i.e. a lower rate than that recorded in previous years. The newly industrialised countries now account for 52% of world production of synthetic fibres whereas in 1980 they only accounted for 39%. Growth in these countries tends to

be concentrated in South-East Asia, which now accounts for 55% of the newly industrialised countries' production. Between 1980 and 1989, Western Europe's share in world production fell by 3 points; it currently represents 18% of total production. The United States, the leading world producer, have also seen a decline in their share of world production, from 27% to 21% over the same period. Japanese production, which now accounts for 9% of world production, represented 13% in 1980. Among those to benefit the most from the growth are Taiwan, South Korea and China.

In 1989 EC industry saw a 1.5% increase in the volume of chemical fibre production, which reached 3 million tonnes, i.e. the equivalent of 16% of annual world production. Since 1980, EC production has grown at an average annual rate of 1.6%. Among the Member States, the largest manufacturers are Germany (34% of EC production in 1988), Italy (23%), the United Kingdom

Table 2
Man-made fibres
share in world production, by product

(%)	1977	1987	1988	1989
Synthetic filaments	20	14.5	13.8	14
Short synthetic fibres	23	20	18.9	19
Filaments and short fibres				
Cellulosic fibres	19	12	13.0	13

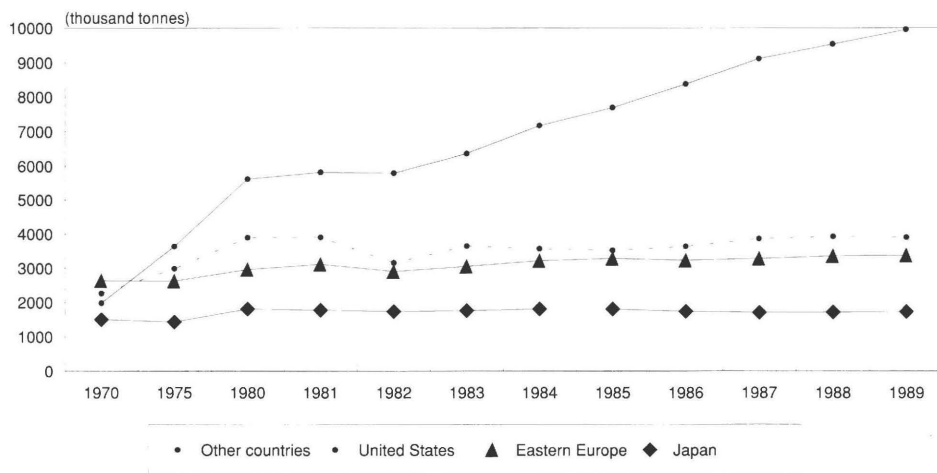
Source: CIRFS

Table 3
Man-made fibres
Production in terms of volume

(Thousands tonnes)	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990(*)
Production	2 585	2 752	2 514	2 636	2 856	2 917	2 883	2 924	2 958	3 076	3 119
Index	89	94	86	90	98	100	99	100	101	105	107
USA	N/A	N/A	2 930	3 380	3 521	3 450	3 568	3 755	3 849	3 838	N/A
Index	N/A	N/A	85	98	102	100	103	109	112	111	N/A
Japan	1 832	1 798	1 759	1 786	1 834	1 834	1 760	1 727	1 736	1 755	N/A
Index	100	98	96	97	100	100	96	94	95	96	N/A
Productivity	2 275.5	2 782.6	2 717.8	3 019.5	3 356.1	3 623.6	3 734.5	3 878.0	4 008.1	4 344.6	N/A
Index	62.8	76.8	75.0	83.3	92.6	100.0	103.1	107.0	110.6	120	N/A

(*) Estimates
Source: CIRFS, Eurostat (Comext)

Figure 1
Changes in world production of man-made fibres



Source: Akzo

(12%) and Spain (10%).

Synthetic fibres As in 1988, world production of synthetic filaments (up 2% in 1989) increased at a higher rate than short fibres (up 1%). Short fibres nevertheless account for the greater share of production, with 54% compared with 46% for filaments. The structure of synthetic fibre production has continued to evolve: the share accounted for by polyester and other synthetic fibres (polypropylene, PVC, elasthane) has increased to the detriment of polyamide and acrylics. Polyester now represents 54% of world production of synthetic fibres, polyamide - 24%, acrylics -

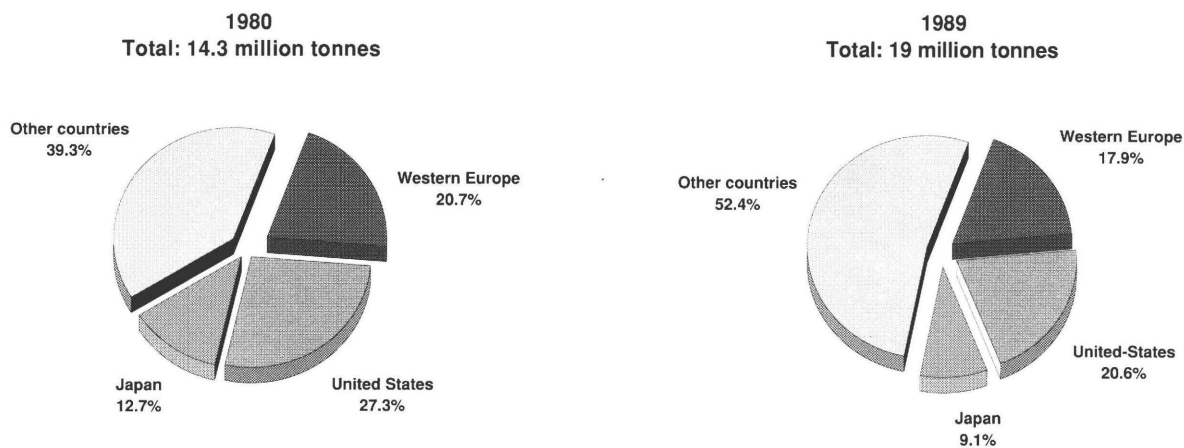
15% and other fibres - 7%, thus indicating steady growth. The growing importance of polyester in terms of synthetic fibres seems to form part of a long-term pattern: polyester's share of total production has been increasing steadily since 1970.

POLYAMIDE At a world level, polyamide production increased by 2% in 1989. Whereas filaments increased by 1%, short fibres increased by 4%. This was higher than the average growth rate recorded in the United States (+ 3%), where around 60% of world production takes place; it reached 2% in Western Europe and the newly industrialised or developing coun-

tries, while in Japan growth tailed off. In 1989, the capacity take-up rate rose steadily to over 85%.

POLYESTER The growth in polyester production slackened in 1989, with a rate of 5%, compared with 7% in 1988. An increase was recorded in all regions except for the United States: Western Europe (+7%), Japan (+9%), other countries (+7%). By contrast, the United States reported a 2% drop in production. European consumption of polyester filament increased by 8% in 1989 and the production capacity take-up rate remained unchanged at 85%, due to the introduction of new capacities. The geographical distribution of polyester production indicates a further increase on the part of newly industrialised countries to the detriment of traditional producers. In 1980, the Far Eastern countries accounted for 22% of world production of polyester; by 1989, their share had risen to 45%; according to the forecasts, they should account for 60% of world production by 1999. The relative decline in European production occurred parallel to this rise: Western Europe's share fell from 15% in 1980 to 11% in 1989; by 1999, it is expected to account for a mere 7% of world

Figure 3
World production of man-made fibres, by region, 1980 and 1989



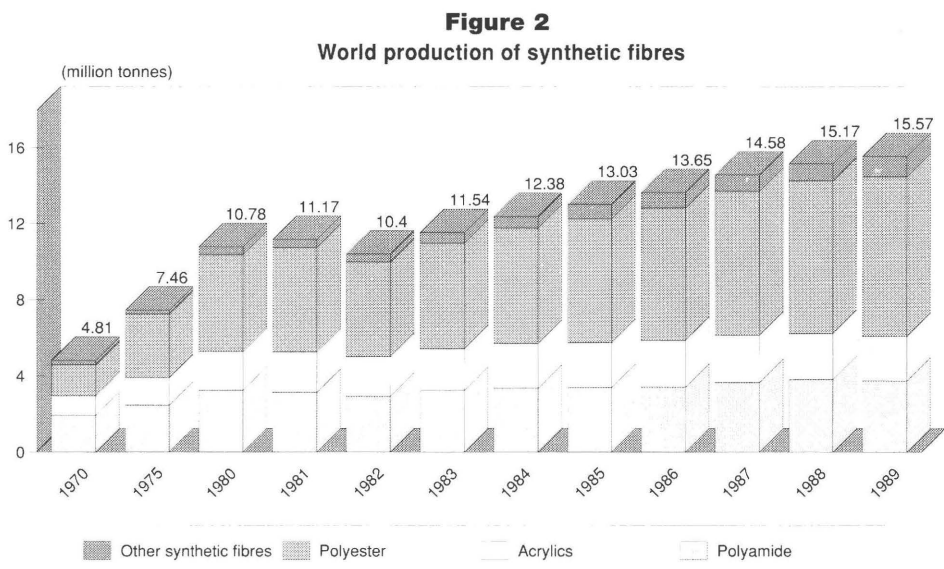
Source: Akzo



production

A survey conducted by the EC in June 1985 led to the temporary introduction of compensatory duties on imports from Turkey, Taiwan, the United States, South Korea, Mexico and Rumania, duties which exceeded 40% in the case of the latter two countries. In December 1988, the industry's margins were particularly low and the EC Council of Ministers confirmed the provisional adoption of antidumping duties imposed on imports from these countries.

The padding fibre sector was granted a provisional stay of five months, during which time the Commission of the European Communities examined the question of the availability of this product on the European market. The final customs duty came into



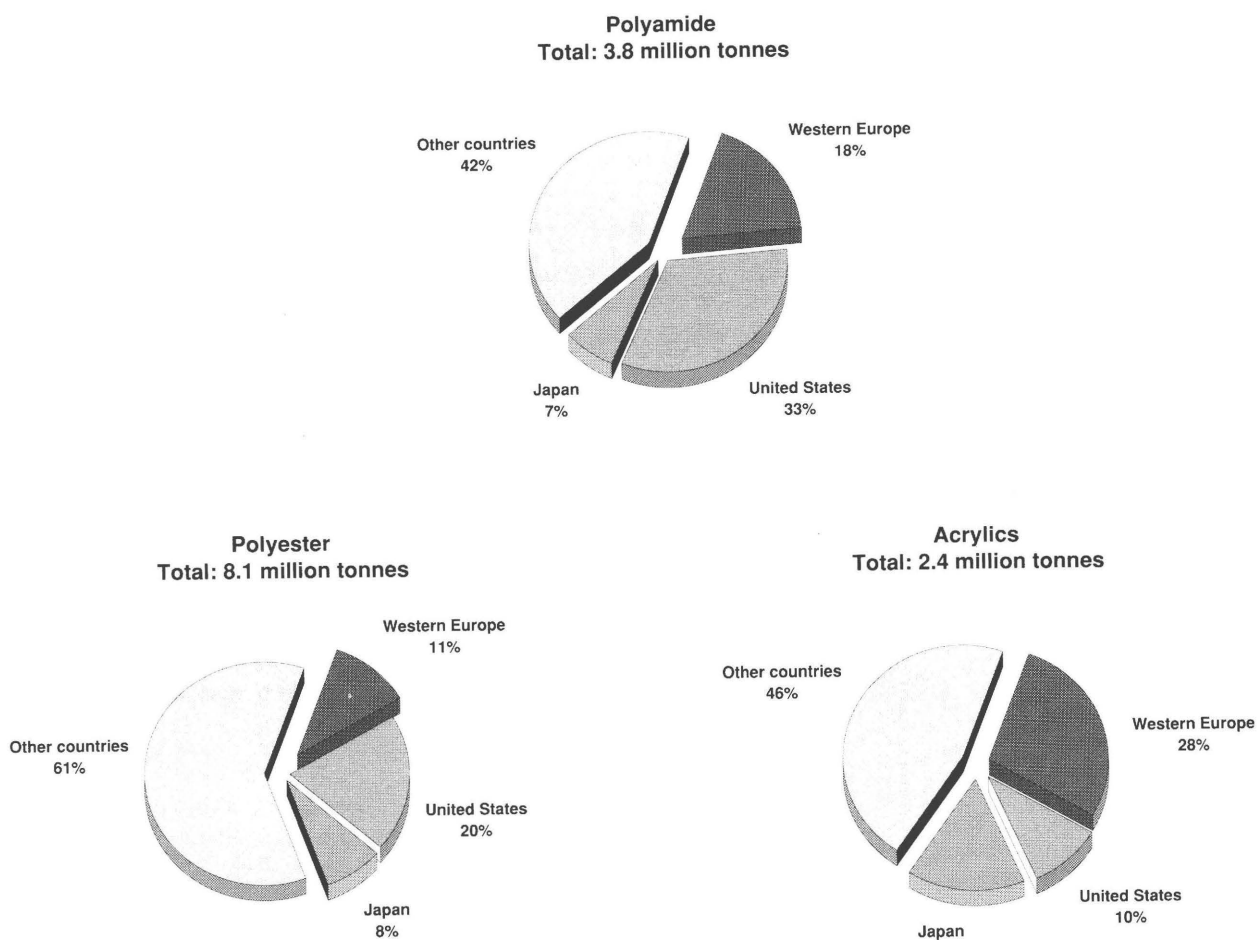
Source: AKZO

effect in May 1989.

ACRYLICS In 1989 the downward trend in world production of acrylic fibres continued and became more pronounced, insofar as

production fell by 6%. The sharp reduction (-7%) in the Western European market and the region's exports played a decisive role in this trend: European production of ac-

Figure 4
Distribution of synthetic fibre production, by region, 1988



Source: AKZO

rylics dropped by 14% in 1989. This drop in production also made itself felt in the United States and Japan. A 2% increase was achieved in other parts of the world. The situation in the acrylics sector has sharply deteriorated since 1987. The market is in a critical state following a drop in consumption of acrylics in certain sectors, a downturn in the fashion industry and a significant increase in imports of finished goods made from acrylic fibres, mainly from Turkey. EC overcapacity in acrylics is currently estimated at over 100,000 tonnes per year. The long-term trend in demand for acrylics appears to be a downward one, and rationalisation has become a key objective for producers. Factory closures are likely in Italy, with Snia, Montefibre and Enichem all selling off their production capabilities to Enimont. By relinquishing its acrylic fibres business to Enimont, Snia is seeking to concentrate on nylon. Similar restructuring could take place in Germany, which would leave just one producer for acrylic fibres.

OTHER SYNTHETIC FIBRES Other synthetic fibres recorded a growth rate of 8% in 1989; they are mainly produced in Western Europe (45%) and the United States (30%). Among these other synthetic fibres,

polypropylene has a clear lead.

Man-made fibres World production of man-made fibres increased by 1% in 1989, evenly split between short fibres and filament. The increase has been most noticeable in the newly industrialised countries (3%) and Western Europe (2%), whereas the United States recorded a 2% decline and in Japan, production dropped by 4%. In Western countries, demand sometimes outstripped supply.

Employment levels

The European chemical fibres industry witnessed a significant, steady drop in the number of employees, partly due to the cut in production capacities and technological developments which reduced the amount of manpower required. Employment levels in this sector fell from 113,600 people in 1980 to 70,800 in 1989.

External trade

In 1989, imports continued to threaten EC producers, who saw their own exports slump by over 20%, thus confirming the trend begun in 1985. EC exports increased in volume by 22% between 1980 and 1985, only to drop by 10% between 1985 and 1988. In total, EC exports increased by a mere 10% between 1980 and 1988.

At the same time, extra-EC imports grew

by 43% between 1980 and 1988. In 1989, the volume of chemical fibre imports was approximately 8% higher than the already high levels recorded in 1988. The result has been a gradual deterioration in the extra-EC exports/extra-EC imports ratio since 1983: it decreased from 1.72 to 1 in 1988, when, for the first time ever, there was an equal volume of exports and imports. The figures for 1989 are expected to reveal a sharp fall in this ratio to below 1. Among the developing or newly industrialised countries, the most dangerous competitors for EC industry are Taiwan (second-largest world producer of synthetic fibres) and South Korea, followed by China, Thailand, Indonesia, India and Pakistan, albeit to a lesser extent. Intra-EC trade, which had increased by an average of 4% per year between 1980 and 1985, has since slowed down: between 1985 and 1988, it increased by a mere 5%.

Technological trends

Over the past 15 years, EC producers have begun to focus on high-value-added specialities (technical yarn, carbon fibres, etc), leaving the vast bulk of basic products to the newly industrialised countries. Research and work on practical applications are mainly geared towards high-

Table 5
Man-made fibres
EC trade in terms of volume

(Thousand tonnes)	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989 ^(*)	1990 ^(*)
Extra-EC exports ⁽¹⁾	452	524	401	492	561	588	516	565	532	425	382
Index ⁽²⁾	82	94	72	88	95	100	88	96	90	72	65
Extra-EC imports ⁽¹⁾	306	264	275	286	364	416	472	501	531	573	551
Index ⁽²⁾	79	60	62	65	88	100	113	120	127	138	132
X/M ⁽¹⁾	1.48	1.98	1.46	1.72	1.54	1.41	1.09	1.13	1.00	0.74	0.69
Intra-EC trade ⁽¹⁾	853	935	869	953	1 069	1 154	1 140	1 203	1 214	N/A	N/A
Index ⁽²⁾	82	87	81	89	93	100	99	104	105	N/A	N/A

⁽¹⁾ Declarant countries - 1980 EC 9; 1981-83 EC 10
Partner country - extra/intra EC 12. Estimates for Greece

⁽²⁾ Estimates

Source: CIRFS, Eurostat (Comext)

tech fibres intended for the carmaking, space and defence industries. According to the forecasts compiled by Frost and Sullivan Ltd, the market for high-tech fibres - from those used for optical cables to composite materials used for jet fighters - should increase from 1.9 million tonnes with a value of 2.4 billion dollars in 1988 to 2.2 million tonnes, i.e. 2.8 billion dollars by 1993. Carbon fibres are expected to grow by 15% per year in terms of volume and 13% in terms of value, whereas optical fibres will increase by 14% per year in volume and only 2% per year in terms of value.

Outlook

Future performance will largely depend on decisions taken by the EC in response to complaints lodged by EC producers regarding unfair pricing practices. Because of the duties charged on imports from a certain number of Third World producers, the pressure should ease off in terms of prices and volume. This should enable prices to be upwardly adjusted, thus ensuring a return to profitability. The measures taken by the EC Council of Ministers and their impact on prices should also have a positive effect on the trade balance. The system of controlling official aid for

Table 6
Man-made fibres
Projections for 1989-94
Growth in production in terms of volume

(Thousand tonnes)	1989	1990	90/89	91/90	92/91	94/89
Production	3 076	3 119	+1,4%	+0,7%	+0,9%	+4,9%

Source: DRI Europe projections

the synthetic fibres industry, introduced by the Commission of the European Communities in 1977, has been extended for a further two years, until 1991, owing to the surplus production capacity which still hampers EC industry. In spite of major restructuring and reconversion efforts, the synthetic fibres industry is still vulnerable: its production capacity still exceeds EC requirements. By maintaining the system, the Commission will continue to ban any official aid in EC countries which could contribute to an increase in production capacities and will support projects aimed at reducing these same capacities. The Commission must be notified of any official aid proposals and no such aid may be granted without its approval. Surplus production is currently put at 150,000 tonnes and could be reduced via the adoption of a series of rationalisation agreements. Following a relative slowdown in EC production between 1984 and 1987, the short-

term prospects for manufacturers of synthetic fibres are now slightly more encouraging. World demand for synthetic fibres, stimulated by demographic growth and the worldwide rise in income, is expected to reach 20.5 million tonnes by 1995. EC production should increase by an annual average of 1.4% in 1990, 0.7% in 1991 and 0.9% from 1992 to 1994. The latest projections show, however, that the gradual shift in production from Western countries to newly industrialised countries is now irreversible.

Written by: DRI Europe
The sector is represented at EC level by:
CIRFS: International Committee for Rayon and Synthetic Fibres
Address: rue Montoyer 24, B-1040 Brussels;
tel: (32 2) 230.95.80; fax: (32 2) 230 60 54

In 1989, the EC petrochemicals industry saw its margins increase for the seventh year, influenced by the dual factors of continuing demand and a reduction in the cost of raw materials, mainly oil and natural gas.

However, in terms of volume, 1989 was characterised by an initial downturn which had begun at the end of 1988.

Capacities were virtually fully used and large-scale investment was anticipated by most operators. However, the fall-off in economic growth which characterised the start of 1990, coupled with the Gulf War, seems likely to profoundly alter producers' expectations, as do the results and risks associated with this industry.

Definition of the sector

As a uniform activity sector, petrochemicals can be defined as the industry which uses the raw materials derived from oil or natural gas to manufacture the two following product categories:

- ❖ primary petrochemical products: ethylene, propylene, butadiene, benzene, toluene, and xylenes, etc.;
- ❖ major monomeric intermediate products and basic organic products (styrene, ethylbenzene, vinyl chloride, etc.).

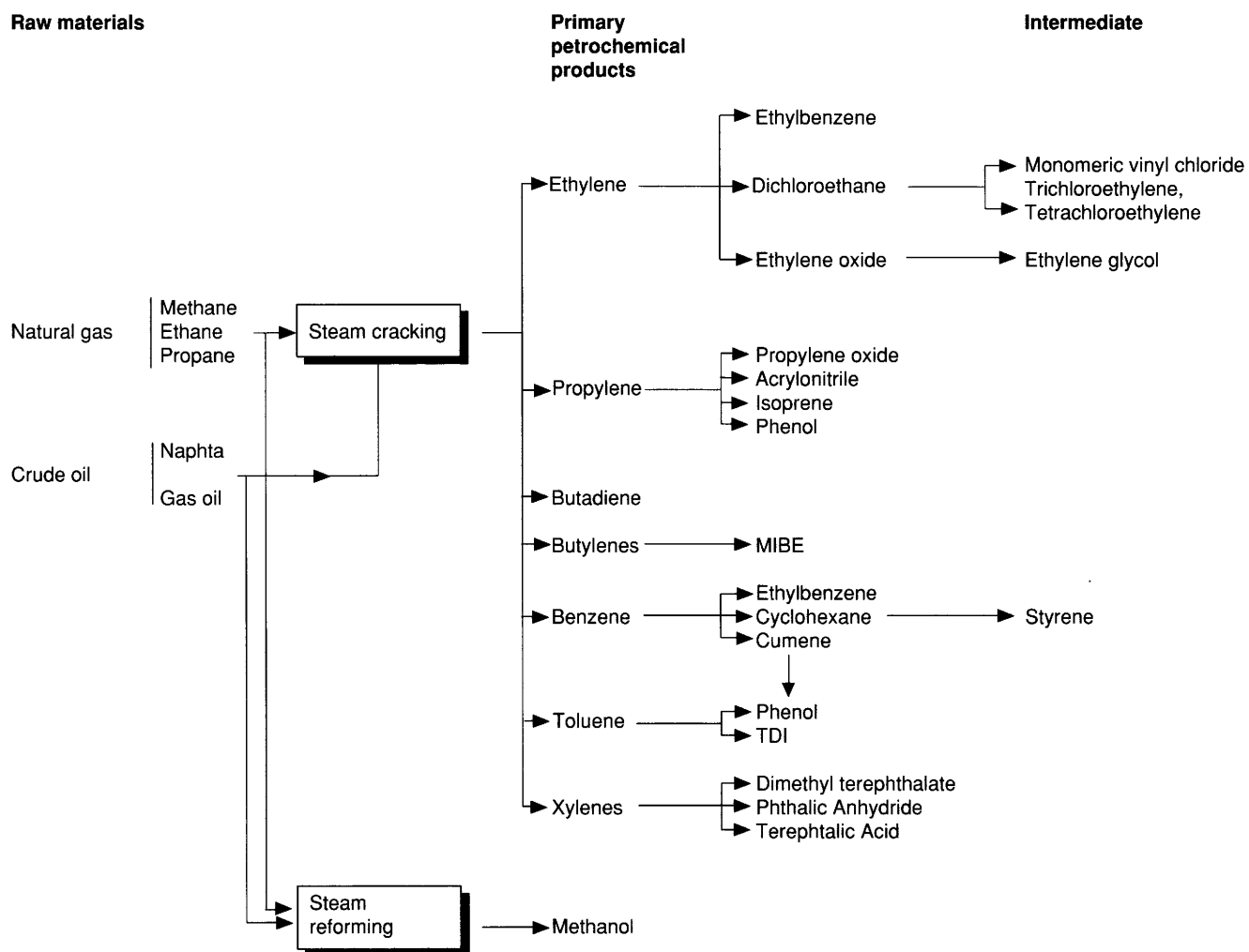
These products, which are referred to as "commodities" as opposed to "specialities" are characterised by:

- ❖ the scale of tonnage used;

- ❖ their relatively low added value;
- ❖ a high degree of reliance upon energy-giving raw materials;
- ❖ a high level of sensitivity to GDP growth;
- ❖ increased unit investments;
- ❖ continuous processes;
- ❖ not labour-intensive.

Polymers, especially thermoplastics for widespread distribution, the production of which is often integrated with the production of primary products and major intermediate products, are not dealt with in this chapter, even though they are classed as petrochemicals. They are dealt with in the chapter on plastics.

Figure 1
Major products of the petrochemicals sector



Source: Sema Group Management Consultants

Current situation

The petrochemicals sector, in terms of basic and intermediate products, accounts for approximately 20% of the total turnover of the chemicals industry, which, in the EC, stood at 320 billion ECU in 1989. This percentage increases to 40%, if we include fibres and plastics.

From 1983, production rose steadily, with differences, however, between individual products and countries.

In 1989, production stabilised in terms of volume as a result of a fall in demand.

The operation rates for units were close to saturation point. In terms of value, company profits were excellent.

Petrochemical production is undertaken by large-scale groups which, having undergone extensive restructuring, still implement a dynamic strategy of acquisitions and joint ventures.

The EC holds a vital position at a world level. Taking the example of ethylene, the EC accounts for 25% of production, the United States 31%, Japan 11%, with the remaining third accounted for by new producer countries.

The drop in economic growth and the increase in the price of oil which characterised 1990 and the beginning of 1991 have resulted in a marked fall in producers' margins.

Production and consumption

Primary or intermediate petrochemical products are used for the production of plastics, fibres, elastomers, solvents, detergents, colouring agents and overall, for the production of miscellaneous products used by all sectors of industry. Their consumption is dependent on several factors:

- ❖ the economic environment and the growth in markets for use: cars, construction, packaging, textiles, rubber;
- ❖ inter-product competition, (e.g. rivalry between plastics) and inter-equipment competition, (rivalry between compound

steels);

- ❖ the emergence of new products;
- ❖ improvement in quality and performance;
- ❖ the influence of environmental restrictions.

Their production cost is particularly affected by the price of raw materials (oil and gas).

After several years of growth, production and consumption of primary and intermediate petrochemical products stabilised in 1989 at the 1988 level.

An analysis of a few primary petrochemical products which are characteristic of all the products and markets is presented in table 2.

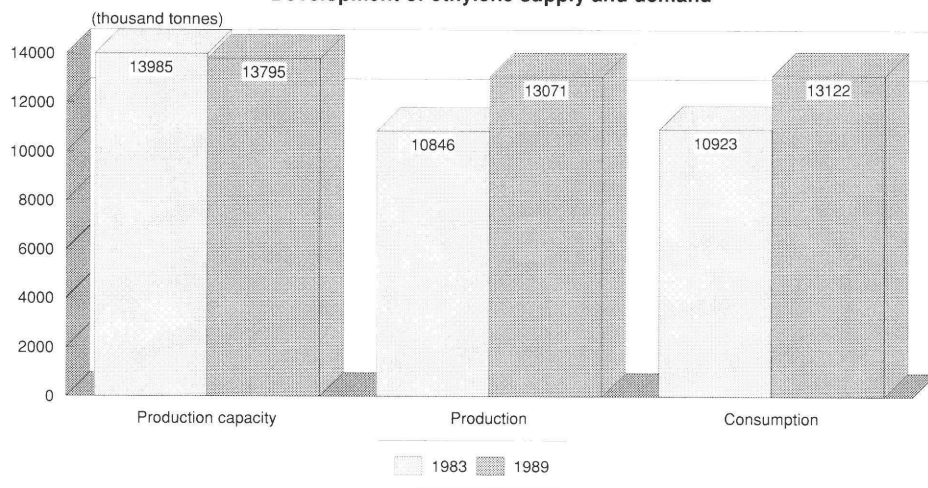
Ethylene EC production, which has seen a steady growth rate since 1985: 4.3% in 1986, 6.4% in 1987, 7.8% in 1988, decreased slightly in 1989, reaching 13.1 million tonnes i.e. a capacity use rate of around 95%. Net imports rose to 54,000 tonnes in 1989, slightly up in comparison with 1988. Consumption, which followed the production trend, reached a level of 13.1 million tonnes in 1989 (down 2% in comparison with 1988). This involves over 80% com-

Table 1
Development of world production of petrochemical products, 1989

(Thousand tonnes)	European Community		USA	Japan	World
	% 1989/88		% 1989/88 (tonnage)		
Ethylene	13071	+2.0	16 033	-5.3	51 800
Propylene	7906	+1.9	8 572	-1.0	25 000
Butadiene	1815	-0.2	1 398	-1.0	6 000
Benzene	5455	-0.4	816	-1.6	21 300

Source: Sema Group Management Consultants

Figure 2
Development of ethylene supply and demand



Source: Sema Group Management Consultants

modity thermoplastics: polyethylenes, polyvinyl chloride, and polystyrene, this particular share is on the increase. The Federal Republic of Germany accounted for 23% of EC production, fol-

lowed by France with 19% and the Netherlands with 17.5%.

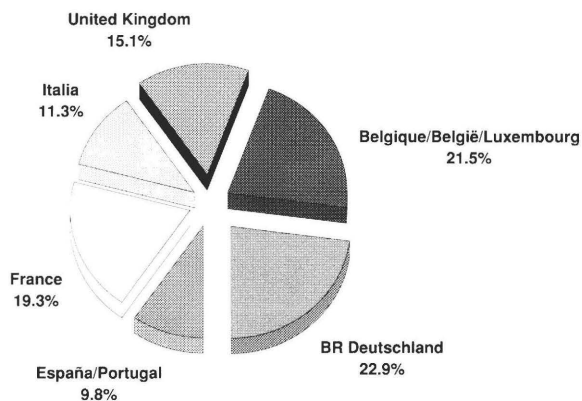
In order of importance, the major producers are: Enimont, Shell, Atochem, Dow and BP.

Table 2
Development of supply and demand within the EC in respect of the primary petrochemical products

(Thousand tonnes)	1983	1984	1985	1986	1987	1988	1989
ETHYLENE							
Actual capacity	13 985	13 443	13 074	12 878	13 230	13 830	13 795
Production	10 846	11 194	11 161	11 636	12 375	13 338	13 071
Consumption	10 923	11 421	11 393	11 813	12 572	13 377	13 122
PROPYLENE							
Actual capacity	7 982	7 751	7 400	7 536	7 885	8 363	8 339
Production	6 067	6 617	6 243	6 632	7 097	7 755	7 906
Consumption	6 281	6 821	6 801	7 151	7 374	7 993	8 057
BUTADIENE							
Actual capacity	2 059	2 051	2 083	1 905	1 983	2 015	2 185
Production	1 653	1 710	1 623	1 552	1 679	1 819	1 815
Consumption	1 167	1 227	1 238	1 208	1 286	1 411	1 405
BENZENE							
Actual capacity	6 586	6 559	6 381	6 611	6 750	6 481	6 614
Production	4 599	4 834	4 796	4 740	5 150	5 475	5 455
Consumption	4 711	5 124	5 077	5 083	5 356	5 956	5 769

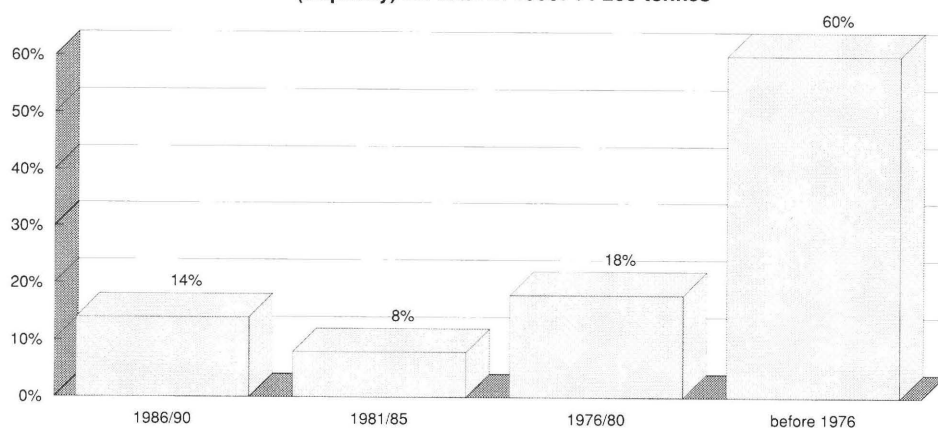
Source: CEFIC, Sema Group Management Consultants

Figure 3
Breakdown of ethylene production within the EC, 1989



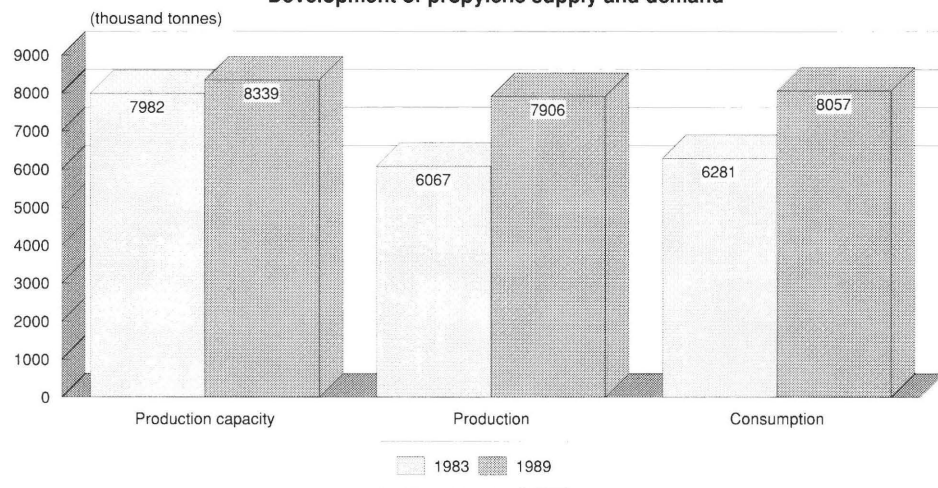
Source: Sema Group Management Consultants

Figure 4
Age of natural ethylene units in existence
(Capacity) EC total in 1990: 14 200 tonnes



Source: Sema Group Management Consultants

Figure 5
Development of propylene supply and demand



Source: Sema Group Management Consultants

Propylene The production of propylene has also increased steadily since 1985: up 6% in 1986, up 7% in 1987, up 9% in 1988, and up 2% in 1989, reaching 7.9 million tonnes in 1989 i.e. a capacity use rate of 95%. Refinery production accounts for around 18% of total production compared with 72% production by steam cracking. The EC is a net importer, i.e. 151,000 tonnes in 1989. Consumption, which reached 8,057,000 tonnes in 1989, can be broken down into two major segments: polypropylene (38%) and other intermediate products for a wide variety of uses, the consumption of which involves many branches of industry.

The Federal Republic of Germany is the major EC producer, followed by France and the Netherlands.

Butadiene Production of butadiene stabilised in 1989 to the same level as 1988, which was a year of strong growth, to 1.8 million tonnes. This represented 83% of capacity.

The EC is a net exporter and consumption, which rose to 1.4 million tonnes in 1989, is mainly for producing synthesis elastomers (for tyres and industrial rubber).

Benzene Benzene production reached 5.5 million tonnes in 1989, a decline in comparison with 1988. The EC is a net importer: 314,000 tonnes in 1989. This represented 82% of production capacities. Over 40% of benzene consumption is intended for the production of plastics (polystyrenes, ABS resins). Other applications are more varied.

Structure of the industry

The petrochemicals industry is a sphere of activity performed by large-scale European or indeed international groups, having already undergone extensive restructuring due to the effect of the oil crises and slow-

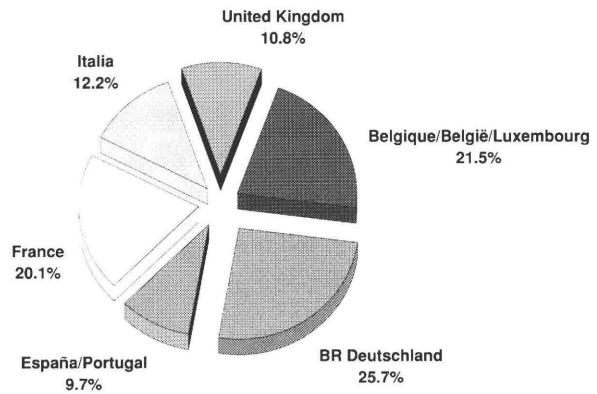
downs in economic growth which characterised the end of the 1970s and the beginning of the 1980s.

Analysis of the list of the 12 leading world chemical firms, draws attention to the presence of 10 EC firms. Amongst these firms, over half are involved with the production of basic and intermediate petrochemical materials, since some companies, such as Rhône Poulenc, have intentionally withdrawn from the field of basic chemistry.

Among the ten non-EC leaders, Dow Chemical (United States), and Exxon (United States), are firmly installed in Europe in the petrochemicals sphere. However, this industry is not exclusively dominated by large firms. There are 10,000 chemical and petrochemical companies in Western Europe producing a turnover of 200 billion US dollars. They employ 2 million people and form the third largest European industry, making a massive contribution to balance of trade assets. Their exported products currently account for over 18.5 billion US\$ in foreign currency, i.e. the equivalent for Europe of the combined exports of the electronics, electrical, car, clothing and textiles industries.

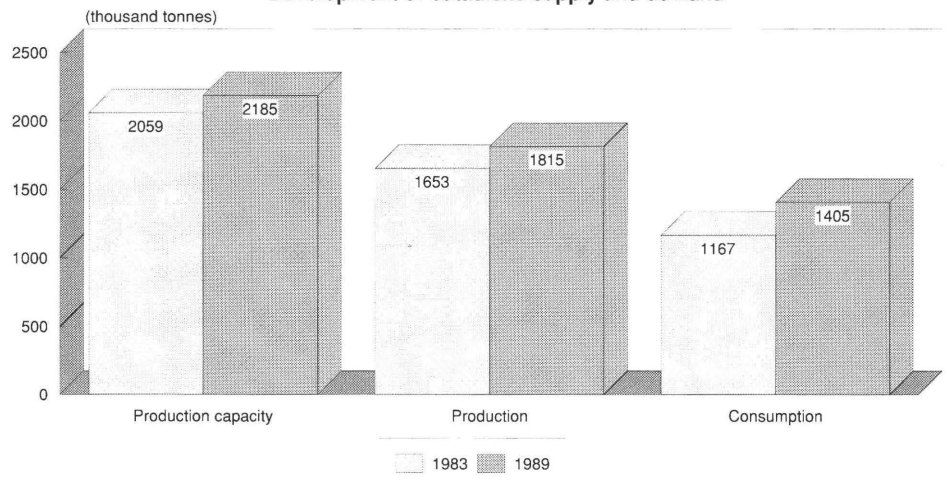
The petrochemicals industry only accounts for one share of the activity of these groups which are, moreover, widely diversified outside the chemicals sector. Some of these producers are oil producers who have chosen to become integrated downstream, thus guaranteeing the control of raw materials for the petrochemicals industry, and, furthermore, finding an outlet within this integration for the by-products of refining and a means of improving their profitability and the added value of their production.

Figure 6
Breakdown of propylene production within the EC, 1989



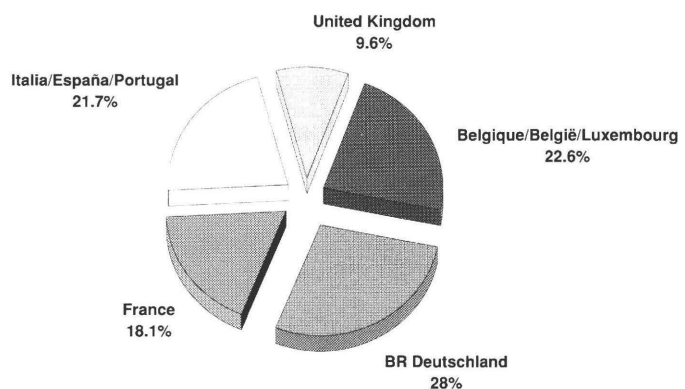
Source: Sema Group Management Consultants

Figure 7
Development of butadiene supply and demand



Source: Sema Group Management Consultants

Figure 8
Breakdown of butadiene production within the EC, 1989



Source: Sema Group Management Consultants

Table 3
Proportion of petrochemicals activity in the turnover of the major European chemical groups, 1989

Companies (country)	World Ranking	Turnover (in Million dollars)	(in % 89/88)	Net Profit (in Million dollars)	(in % 89/88)	Proportion of activities involving basic chemicals in %
Hoechst (BRD)	1	24 414	+12	1 133	+5.7	12.0
Bayer (BRD)	2	23 031	+7	1 126	+10.8	14.0
BASF (BRD)	3	22 269	+9.6	1 072	+42.9	20.0
ICI (GB)	4	21 557	+12.6	1 730	+26.3	19 ⁽¹⁾
Ciba-Geigy (CH)	8	12 597	+17	952	+17.5	-
Shell (GB/NL)	9	11 902	+5	1 589	-5	11.6
Rhône-Poulenc (F)	10	11 440	+11.8	641	+18.4	44 ⁽²⁾
Ferruzzi (I)	11	10 931	+1.2	842	+73	-
AKZO (NL)	13	8 835	+13	450	+13	46.5 ⁽³⁾
Elf Aquitaine Chimie (F)	14	8 820	+18.4	523	+19	25.0
Sandoz (CH)	17	7 639	+23	586	+26	-
Solvay (B)	20	6 517	+1.3	424	+10.6	-

(1) Plastics included

(2) All basic chemistry, specialties, minerals and films

(3) Chemistry total

Source: Informations chimie, Sema Group Management Consultants

Other producers have developed other methods of making sure their raw materials are controlled:

- ❖ co-operation agreements with firms in producer countries;
- ❖ producer countries acquiring direct shareholding in company capital;
- ❖ development of close ties with the oil producers.

Restructuring within the petrochemicals sector has taken some very varied forms over the last ten years:

- ❖ replacing existing businesses;
- ❖ partial or total divestment;
- ❖ repurchasing of businesses;
- ❖ closure of units.

This restructuring has prompted a reduction in the number of producers and sites as well as a shift in emphasis with regard to certain products. Thus, in the EC in 1990, there were only 19 producers of ethylene, compared with 25 in 1985. This restructuring also brought about a 4 million tonne reduction in ethylene production capacities, i.e. 10% of world plants. The cost of reorganising petrochemical production amounted to 10 billion US dollars. Having benefitted since the mid 1980s from a favourable economic climate and falling oil prices, the EC petrochemicals industry has been able to achieve levels of profitability which could not have been fore-

seen by manufacturers within the sector. However, even in 1990, a marked drop in profit margins was observed.

As far as the geographical breakdown of the EC ethylene capacity is concerned (14,200 tonnes in 1990), only 12% is situated in regions assisted by the EC Commission within the context of the objective.

These regions include:

- ❖ Spain: Andalucia, Asturias, Castilla-Leon, Castilla-La Mancha, Ceuta-Melilla, Valencia, Extremadure, Galicia, the Canary Islands, Murcia;
- ❖ France: Overseas departments, Corsica;
- ❖ Greece: The whole country;
- ❖ Ireland: The whole country;

Table 4
Development of the structure of ethylene production within the EC since 1980

Country	Number of Operators			Number of sites			Average Capacity per site			Total Capacity per country		
	1980	1985	1990	1980	1985	1990	1980	1985	1990	1980	1985	1990
France	8	8	6	9	8	8	305	311	333	2 750	2 490	2 665
BR Deutschland	10	9	9	13	11	8	347	327	392	4 506	3 600	3 135
Italia	5	2	1	6	4	4	241	290	373	1 450	1 490	1 490
United Kingdom	5	4	4	7	5	5	280	296	429	2 240	1 480	2 145
Nederland	4	3	3	6	4	3	448	560	825	2 690	2 240	2 475
Belgique/België/Luxembourg	1	1	3	1	1	1	575	525	560	575	525	560
Hellas	1	1	1	1	1	1	15	15	20	15	15	20
España	3	2	2	3	3	2	363	317	503	1 090	950	1 005
Portugal	1	1	1	1	1	1	300	300	300	300	300	300
EC Total	38	49	30	47	38	33	319	326	415	15 616	13 090	13 795

Source: Sema Group Management Consultants (CHEMEUROPE Database)

- ❖ Italy: Abruzzi, Basilicata, Calabria, Campania, Molise, Puglia, Sicilia;

- ❖ Portugal: The whole country;

- ❖ United Kingdom: Northern Ireland.

Consequently, 88% of this total ethylene capacity is situated in developed industrial zones.

Position of the EC within the world petrochemicals industry

The United States leads the petrochemicals field with 31% of world ethylene production. The EC accounts for 22% and Japan 11%.

New producers with available energy resources have emerged on the world scene, particularly in Southeast Asia, Brazil and the Middle East. In 1990, the installed ethylene capacity could be broken down as shown in figure 11.

Trade trends

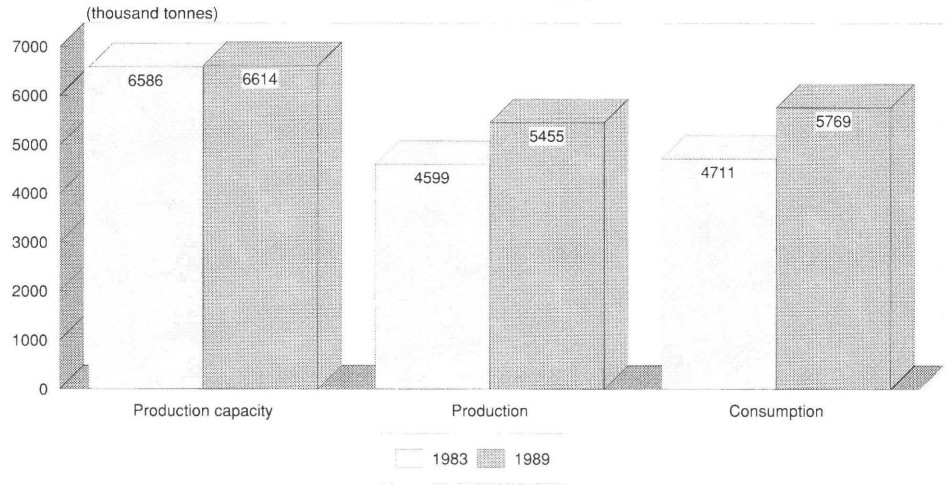
The available data concerns the whole NACE 252 list, and also includes monomers and intermediate petrochemicals, plastic resins dealt with in the chapter entitled "Plastics" and intermediate organic chemicals.

The EC is a net exporter, with an extra-EC balance of trade of 3.3 billion ECU in 1989, down by 30% in comparison with 1988 as a result of a sharp increase in imports.

The major exporting countries (for extra-EC consignment) are the Federal Republic of Germany (42% of extra-EC exports), followed by the Netherlands (12%), the United Kingdom (11%), Italy (11%), France (10%).

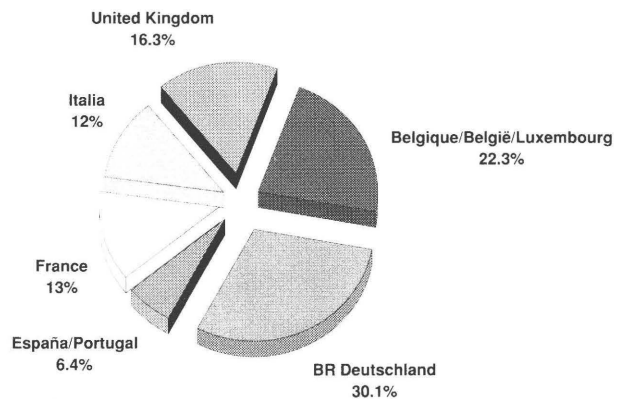
The major importers (extra-EC imports) are the Federal Republic of Germany (22%), Italy (16%), France (14%), the United Kingdom (12%), Belgium and

Figure 9
Development of benzene supply and demand



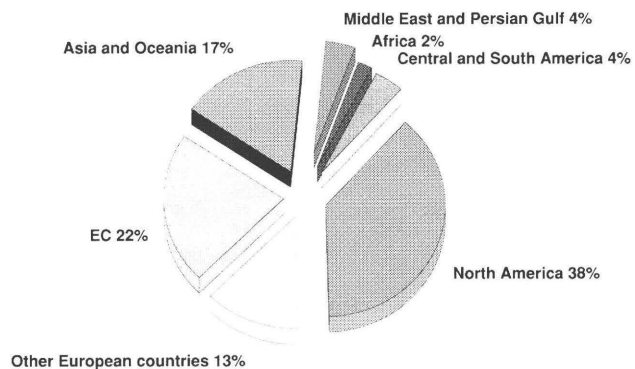
Source: Sema Group Management Consultants

Figure 10
Breakdown of benzene production within the EC, 1989



Source: Sema Group Management Consultants

Figure 11
World breakdown of ethylene capacity, 1990



Source: Sema Group Management Consultants

Table 5
External trade (NACE 252)

(million ECU)	1980	1985	1986	1987	1988	1989	1990 (*)
Extra-EC imports	4 795	10 295	9 107	9 218	10 992	13 377	12 958
Extra-EC exports	8 960	16 270	13 639	13 470	15 720	16 643	14 649
Net extra-EC exports	4 160	5 975	4 532	4 522	4 728	3 266	1 691
Intra-EC imports	14 844	27 447	28 357	28 916	33 645	37 691	N/A

(*) estimates
Source: Eurostat

Luxembourg (11%).

The export/import ratio slipped from 1.9 in 1980 to 1.2 in 1989.

Intra-EC trade accounted for 37.7 billion ECU in 1989, i.e. a 12% increase in comparison with 1988.

Analysis of sales by EC producers of petrochemical products demonstrates that these sales could be broken down on average as follows: 25% on the national market, 25% in Europe, 50% outside Europe.

Employment

The EC petrochemicals industry, including plastics, employs some 600,000 people.

The surplus production capacities at the end of the 1970s and the beginning of the 1980s were accompanied by extensive restructuring within the industry, especially during the period 1982-1984 in which the petrochemicals workforce dwindled by 6%. From 1984, however, the beginnings of a recovery in terms of production led to a stabilisation in employment volumes which should be sustained in the period 1990-1991. The petrochemicals industry is heavily automated, with minimal use of labour.

Investments

Two types of investment exist side-by-side:

- the construction of new units;
- the improvement of existing units:
- ❖ elimination of bottlenecks;
- ❖ saving energy;
- ❖ modification of unit flexibility;
- ❖ modification of processes;

❖ consideration of environmental protection and safety objectives.

The major part of investment spending is aimed at improving productivity, introducing new products and processes, computerising the operation of production units, safety and environmental protection.

The petrochemicals industry does not foresee any major change in basic technologies, even though it is continuing to develop its own technologies with the innovation of new processes and products.

Conversely, the industry has given its approval to considerable efforts as far as environmental protection policies are concerned.

Petrochemicals investments account for: around 10% of investments in the chemicals industry sector; 3% to 4% of petrochemicals turnover.

The growth rate for investments was very high during the last few years (10% in 1989). A slowdown is anticipated from 1990 onwards.

Research and development

The manufacturing processes in operation within the industry range from naphtha steam cracking, which is the source of basic petrochemical products, to processes at the very forefront of scientific research. Many European producers in the field of petrochemicals are already involved in new state-of-the-art technologies such as

genetic techniques or the development of new equipment and industrial compounds.

The share allocated by the chemicals industry to R & D exceeds the share allocated by all the other industries. Over 8 billion US dollars per year, i.e. around 4% of turnover, are spent on research and development work. In sectors such as pharmaceuticals, pesticides and agricultural fertilizers, investments reach 10% and 12%. These figures must be compared with the 2% of the Gross National Product devoted to research by all the European industries and governments.

Firms which have to face even higher costs for R&D purposes are restricted to pursuing their petrochemical operations. Likewise, an industrial logic lies behind such integrated operations. Several major European chemicals and petrochemicals companies have combined their production of petrochemical raw materials with their production of chemical products in order to keep production costs at their lowest level and remain competitive at an international level.

Products derived from this basic raw material will in turn become a raw material for the manufacture of high-value-added products.

Development factors

Four main factors affect the development of the EC petrochemicals industry:

- ❖ the price of oil;

- ❖ economic growth;
- ❖ the parity of the dollar and the economic policy of the United States;
- ❖ environmental protection policy.

The price of oil The petrochemicals sector is a heavy consumer of oil products. The proportion of energy-producing materials accounts for most of the production cost of a cracker. In the mid 1980s, the drop in oil prices helped re-establish a very satisfactory margin.

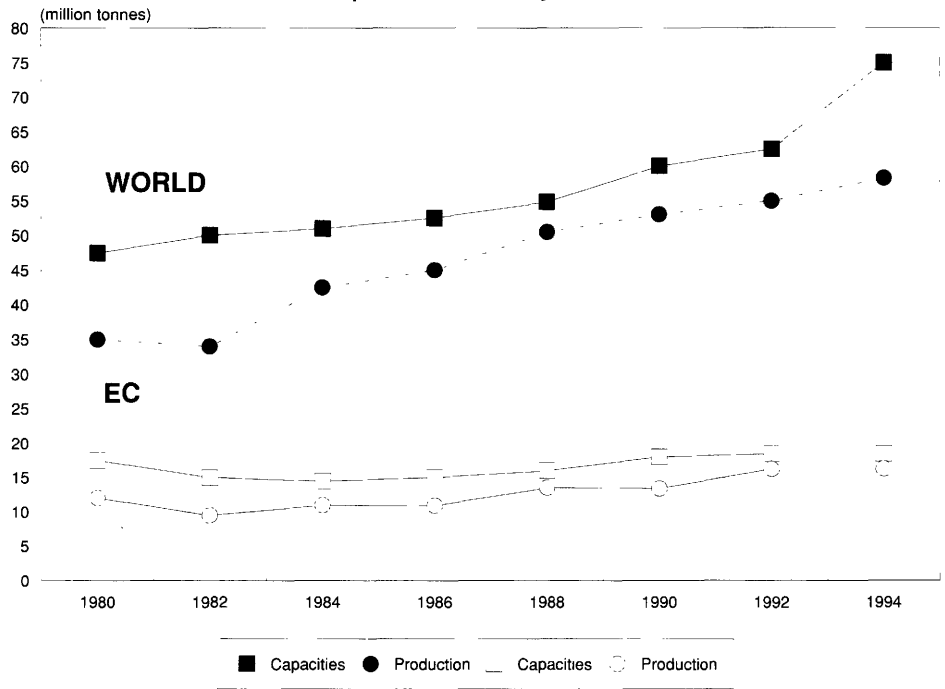
The price of naphtha, which follows the price of a barrel, more than doubled during the summer of 1990, jumping from 150 US dollars to 400 US dollars per tonne, before stabilising at around 300 US dollars.

This tariff inflation, which was very slightly toned down by the fall of the dollar, represents a serious threat to petrochemical margins, insofar as firms do not want to suffer excessively harsh repercussions from these tariff increases.

For manufacturers within the sector, it is now vital that demand for basic chemical products should not tail off in the future and, therefore, that the world economy should not dry up. Current investments should actually help shift the capacity of ethylene from 15 million tonnes to around 20 million tonnes in 1994, i.e. an increase of 21%, and should magnify surplus production capacities to the same extent in the event of a crisis.

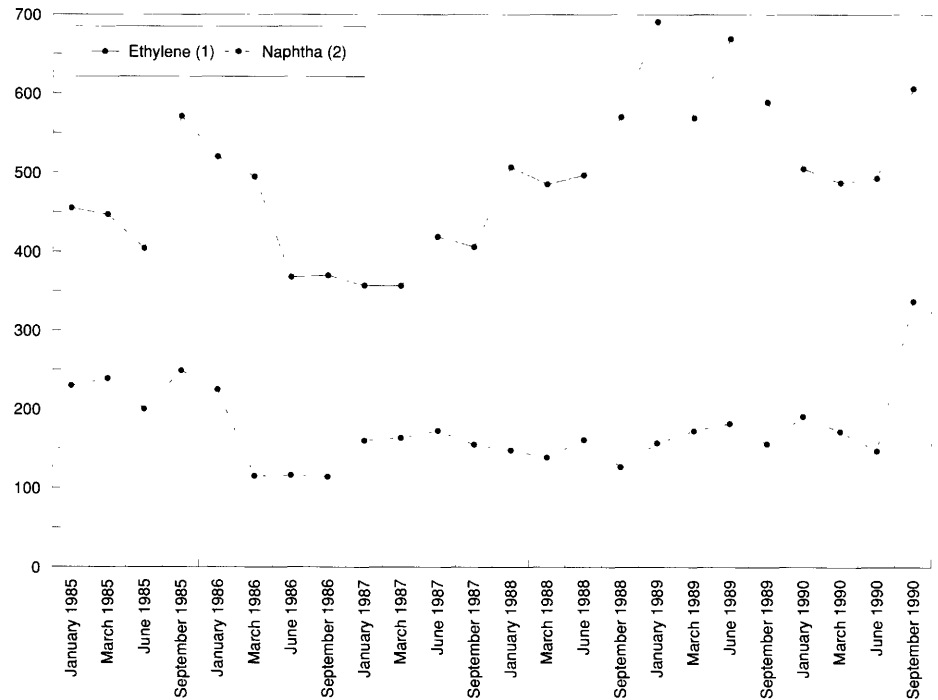
However, there is a risk that ethylene and its derivatives produced in new installations in the Gulf could arrive on EC markets to unbalance this Community industry during its restructuring phase. This would mean a deterioration in market conditions for those companies which, in Europe, have just borne the costs and sacrifices of

Figure 12
European and world ethylene situation



Source: SCOB

Figure 13
Development of the price of ethylene and naphtha



(1) European spot price in US\$ per tonne
(2) cif spot price in US\$ per tonne
Source: Sema Group Management Consultants

factory closures in order to stabilise the EC market.

This very growth should again lend a more marked competitive advantage to countries with available oil and gas resources, and could bring about a profound

alteration in terms of supply structure and competitive positioning. EC firms could be prompted to take a more active role in projects involving new producers, to enhance resources which, up to now, could not be economically exploited, and improve their

Table 6
Expansion of ethylene capacities anticipated within the EC

Companies	Sitres	Extra capacity (in tonnes/year)	Start Date	Future capacity (in Million tonnes)	% (Basic 1989)
Finaneste (joint venture Pétrofina 65%/Neste Oy 35%)	Antwerp (B)	450 000	1991	N/A	N/A
Erdöchemie (joint venture BP/Bayer)	Dormagen (FRG)	240 000	1991	15 790	+ 4.6
Exxon/Shell	Mossmoran (UK)	250 000	1992	N/A	N/A
British Petroleum	Grangemouth (UK)	330 000	1992	N/A	N/A
Vebe	Gelsenkirchen (FRG)	440 000	1992	N/A	N/A
Enichem	Brindisi (I)	350 000	1992	17 160	+ 13
BASF	Antwerp (B)	600 000	1993	N/A	N/A
Repsol	Cartagena (E)	500 000	1994	18 260	+ 21

Source: CCE (= Comité Centrale d'Entreprise - Central Business Committee) Elysees Bourse and Ministry of Industry

competitiveness (concentration, specialisation, market control).

In order to maintain their competitiveness on traditional markets, EC petrochemicals firms will have to keep control of the EC single market (integration) and offer resistance in respect of export markets (plants, acquisitions, agreements).

Economic growth Petrochemical producers dread a slowdown of the world economy much more than an explosion in the price of crude oil. It is difficult to predict the development of demand for basic chemical products over the next five years, especially when new surplus production capacities are emerging.

Petrochemical producers dread once again finding themselves caught between surplus production on one side and a lifeless market on the other.

Surplus production capacities are a very real danger; around 700,000 extra tonnes of ethylene will arrive in Europe with the advent, in 1991, of the new Finaneste steam cracker in Antwerp (Pétrofina-Neste

Oy) and a new unit in Germany (BP-Bayer). Many doubt the possibility of recouping such investments. At present, a 500,000 tonne steam cracker represents an investment of 4 to 5 billion FF. It is vital for this machine to run at 80% of its capacity and provide good margins to cover the price of raw materials and, more especially, to pay off the fixed charges, around 500 million FF per year.

Parity of the dollar Variations in the dollar since 1983 have been universally favourable to the European petrochemicals industry (fall in supply costs, fall in the cost of borrowing quoted in dollars, non-immediate side-effects of these falling costs on sales prices), except for countries which are very heavy exporters or European groups which are firmly established in the United States.

Environmental protection

The chemicals sector is the prime branch of industry as far as pollution and risks are concerned.

The development of environmental protection policies has been an influential ele-

ment in stimulating innovation and competitiveness for the industries.

Pollution by the petrochemicals industry has greatly diminished over the last 15 years, thanks to various activities:

- the shutdown of former plants the performance levels of which, including performance in terms of preventing pollution, were unsatisfactory;
- modifications applied to processes to make them less pollutive;
- effluent processing plants set up downstream from pollutive units;
- the replacement of former units with units using clean technologies.

The concept of clean technology is very closely related to the concept of new units, because today, as far as possible, only clean units are built, and this concept is imposed from the research stages and through to the development of the process. Even if the reduction of pollution at source does not completely remove a processing plant at the end of the pipe, the running costs for this unit will be greatly reduced

due to the fact that there is less discharge and fewer pollutants to process.

Furthermore, some synthesis products, by their very nature, cannot be clean: thus the manufacture of propylene oxide using chlorhydrin in which all the chlorine used re-emerges in the form of salt or dichloropropane, and not propylene oxide.

This process is currently being phased out, just as the same process using chlorhydrin for the manufacture of ethylene oxide has already disappeared, replaced by direct oxidisation of the ethylene on a catalyst in a fixed bed, which is a more effective method.

The search for VOCs (volatile organic compounds) is a new concern which must be resolved by equipping loading/unloading/storage plants with steam recovery systems.

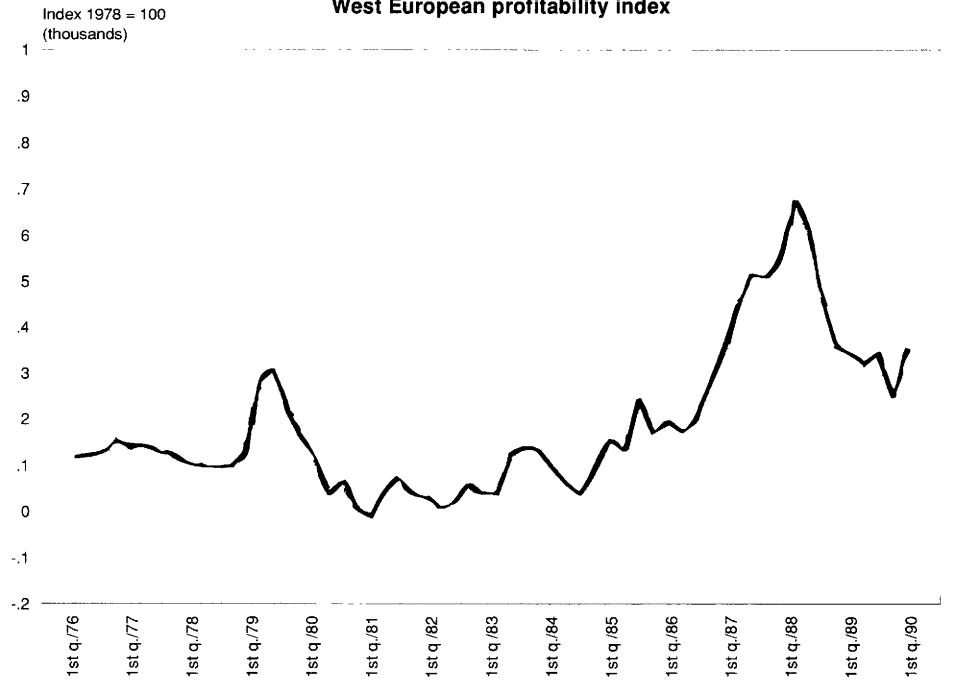
Outlook

In the coming decade, petrochemical firms will attempt to consolidate their position within a sector where they already hold a dominant position, rationalise their business activities by giving up secondary sectors and, ultimately, adopt a more global approach by implementing an overall production and marketing strategy.

Figure 14 shows that profitability levels are recovering and reaching a more "normal" level, although a drop was recorded after a considerable peak period in 1989. It clearly seems that the petrochemicals industry will not undergo any new crisis similar to that of 1982 - moreover it is unlikely that the same situation will be repeated in the future.

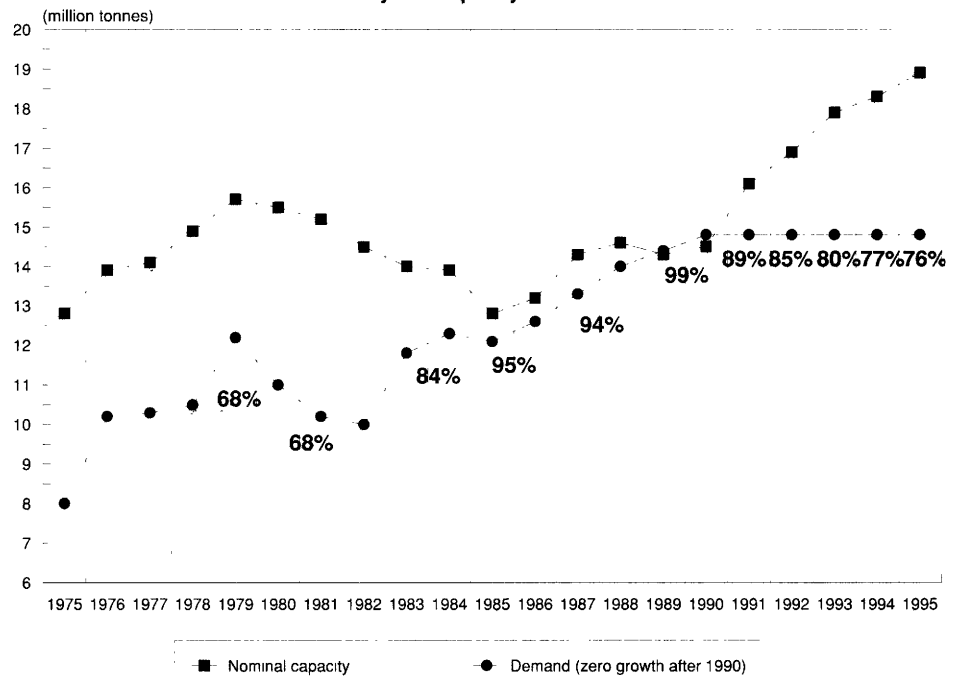
The two major factors which will influence the petrochemicals industry in western Europe between now and the end of the present decade are most certainly the

Figure 14
Petrochemicals and polymers
West European profitability index



Source: Chem systems

Figure 15
Ethylene capacity and demand



Source: APPE

price of crude oil and the environment.

Other factors obviously come into consideration, but these will have only a limited impact:

- ❖ The implementation of the single market in 1992 will have little influence on petro-

chemical products;

- ❖ The unification of Germany is a fait accompli. The other Eastern European countries and the USSR will have a negligible effect between now and the year 2000:

❖ Some chains of effect could occur in Asian countries insofar as countries currently exporting in Asia will turn their efforts towards Europe.

However, the potential impact will be limited, given that Southeast Asia will continue to be the region with the strongest growth rate.

The environment will probably be the only factor to play a key role in the restructuring of the industry during the coming decade. The problem of plastic waste is the subject of growing interest, an area in which the Federal Republic of Germany has already implemented strict legislation and for which an EC directive is being prepared. These steps require increased le-

vels of recycling for plastic waste after use. The effect on the crude polymers market will be quite considerable.

Some firms will continue to reduce their activities based on the petrochemical products currently in use and turn towards sectors with potential for increased productivity. In fact, primary petrochemical products (olefins and aromatic hydrocarbons) as well as the basic derivatives scarcely benefit from a universal approach. These companies could reduce their involvement in the basic petrochemical products sector.

Their market shares would then fall into the hands of integrated oil companies.

This trend has been observed for some time and there are several genuine chemi-

cal firms with interests in basic petrochemistry such as the major German companies and Dow.

The health of the petrochemicals industry for the present decade will depend on the degree of utilisation of plants (cf. figure 15). It is therefore essential for petrochemical firms all to avoid investing simultaneously in new production capacities as soon as market prospects will allow.

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