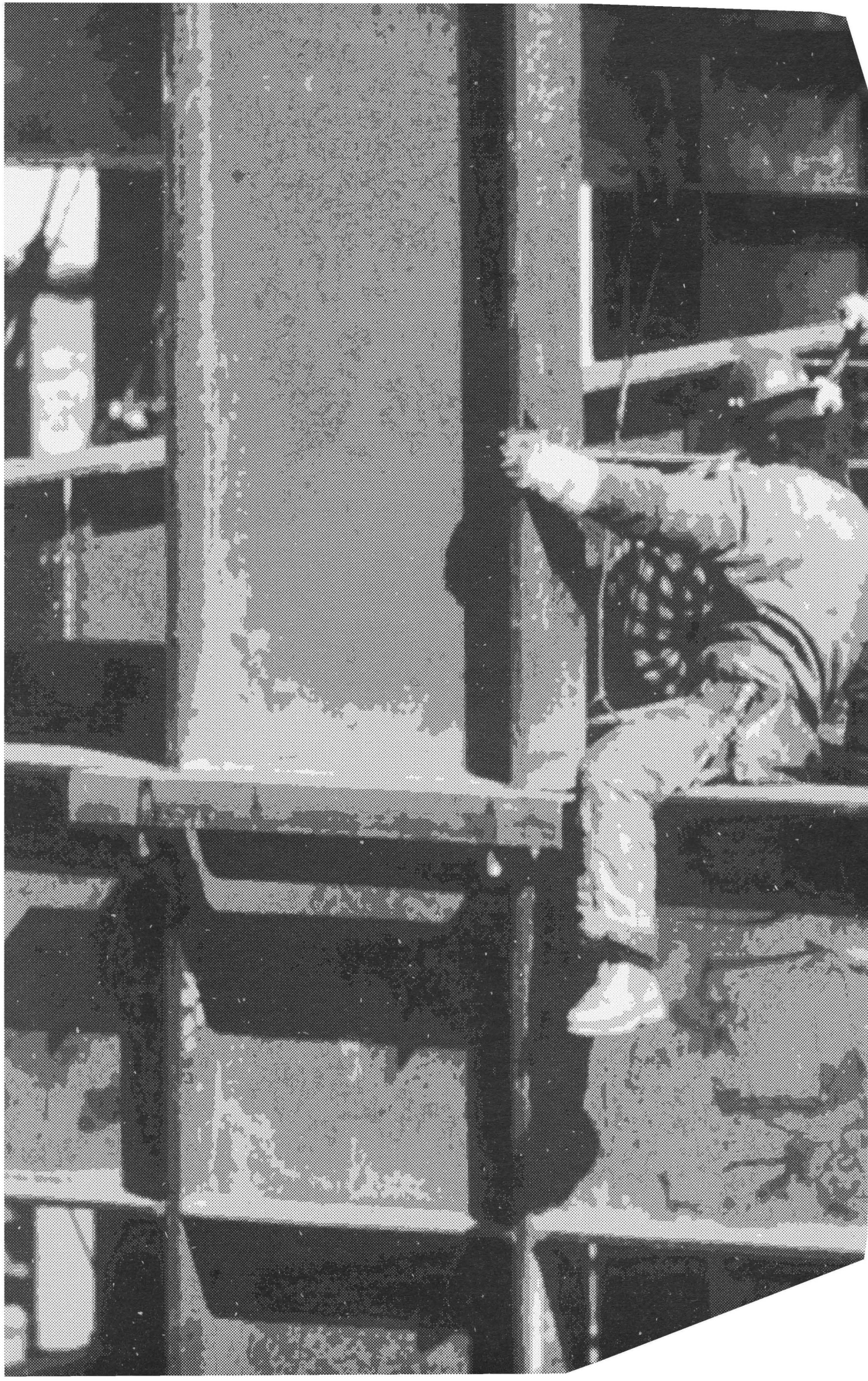


Metal products



The EC metal products sector covers a wide range of products and consists of a large number of small and medium-sized firms. Since it mainly produces intermediate and investment commodities for other manufacturing industries, the sector was badly affected by the industrial crisis in the early 1980s. The restructuring which followed was accompanied by major job cuts and gave rise to improved productivity. As a result, from 1987 onwards, metal product manufacturers were able to profit from the growth experienced in the various industrial client sectors. It was not until 1988 however, that for the first time in nine years real output exceeded its 1980 levels. In 1989, output grew by 12% compared with 1988. Although the industry is a net exporter, external trade does not account for a large share of the market. Furthermore, intra-EC trade accounts for only a small share of production.

The importance of the industry in the EC economy

Current situation The production of metal products within the EC (NACE 31) constitutes one of the main sectors in the metal manufacturing industry. With output amounting to approximately 163 billion ECU in 1989, the industry accounts for nearly 7% of the EC manufacturing industry. The workforce which it employs, i.e. 2.2 million people, is larger, for example, than in the carmaking or chemicals sector.

The European Community is the leading world producer of metal products, followed closely by the United States and Japan.

The latter, however, has the highest

growth rate (13.8% per year from 1980 to 1989, as against 5.7% in the EC over the same period).

Production and consumption Metal products are basically intermediate commodities and, to a lesser extent, investment commodities. On average, final consumption does not account for more than 10% of total demand. Among the industry's main clients one finds:

- ❖ transportation equipment (forged products etc.);
- ❖ mechanical engineering (tools, etc.);
- ❖ construction (constructional steel work).

These sectors performed rather poorly during the first half of the 1980s, thus explaining the crisis which affected the metal

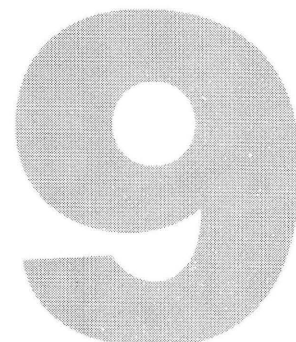


Table 1
Metal products
Main indicators, 1980-89

(million ECU)	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989 ^(*)
Apparent consumption	92 306	93 337	97 512	99 790	108 317	115 021	119 212	124 561	139 185	156 929
Net exports ⁽¹⁾	6 448	8 702	9 915	9 362	9 204	9 446	8 365	7 164	6 326	6 367
Production	98 754	102 039	107 427	109 427	117 520	124 467	127 577	131 725	145 511	163 296
Employment (thousands) ⁽²⁾	2 467	2 491	2 371	2 317	2 230	2 158	2 131	2 123	2 123	2 166

(¹) 1980 EC9; 1981-85 EC10

(²) 1980-85 Spain estimated by Eurostat

(³) estimated

Source: ORGALIME, Eurostat (Inde, Comext)

products industry over the same period. The recent recovery in EC industry has triggered an upturn in the metal products market, which following a period of low constant growth between 1984 and 1987, grew by 11.7% in 1988 and 12.7% in 1989. Output followed the same pattern and in 1989 stood at 163.2 billion ECU (12.2% up on 1988). Almost every EC country recorded an increase in output in 1989.

External trade The metal products sector accounts for only 3% of world exports and ranks fifteenth in the list of exporting sectors. The EC metal products industry is concentrated on the EC internal market. Intra-EC trade accounted for 11% of production in 1989, and grew by 16.5% compared with 1988. In 1989, only 8% of total output was exported to non-EC countries and extra-EC

imports only accounted for around 5% of domestic consumption. The imports/exports cover ratio, however, has fallen constantly since 1982. Imports are increasing at a faster rate than exports. This deterioration in the trade balance is partly due to the role played by new producer countries such as South-East Asia, Argentina, Brazil, Mexico or India in international trade. Trade is also increasing between developing countries, with North Africa and East Asia exporting to southern countries. The EFTA countries are the EC's main clients (35% of exports); they are also the EC's leading suppliers (42%), followed by the United States (18%). Within the EC, Italy and Germany have the highest export rates, with 83% and 22% of output respectively. France and the United Kingdom, on the other hand, are suffering from a structural deficit.

Both of these countries export roughly 12% of their output and are less competitive than the previous two countries.

Employment The drop in demand which characterised the early 1980s had serious repercussions on employment. Between 1980 and 1987, for example, the number of jobs decreased by 14%, from 2,467,000 in 1980 to 2,123,000 in 1987. Employment levels have since stabilised and even rose slightly in 1989 (2,166,000). West Germany accounts for 35% of the total number employed in the industry within the EC, followed by France (17%) and Italy (10%).

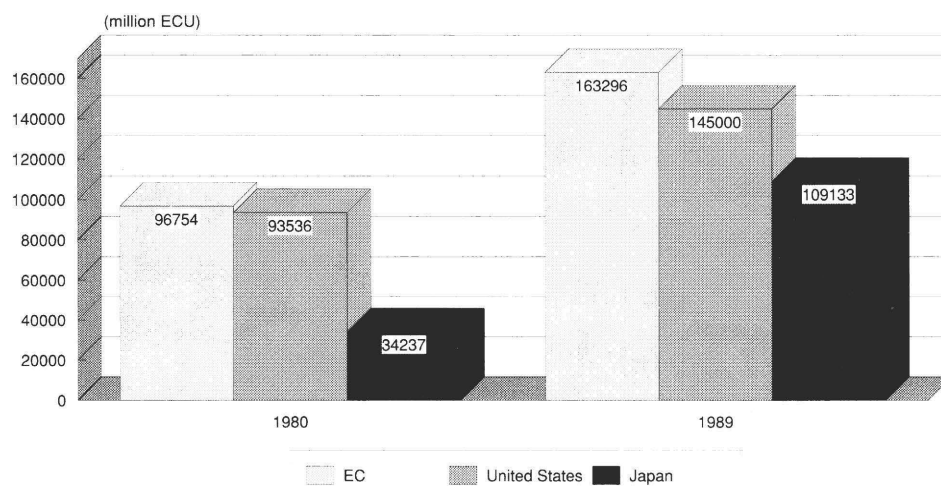
Productivity Productivity in the EC metal products industry improved significantly between 1980 and 1989, despite a very low rate of growth in output, thus confirming the effect of restructuring.

The improvement was aimed at three basic aspects of the industry's competitiveness: raw materials, labour and energy, mainly through the introduction of robotisation and the mechanisation of the various processes.

Productivity levels in the metal products industry are slightly lower than in the other metal-working sectors. Nevertheless, productivity levels since 1980 have followed a similar pattern to those observed in all the other metal-working industries.

Investment Following a decline in 1981 and 1982, investment gradually re-

Figure 1
Metal products
EC output compared with that of the United States and Japan 1980-88



Source: Eurostat, DRI Europe

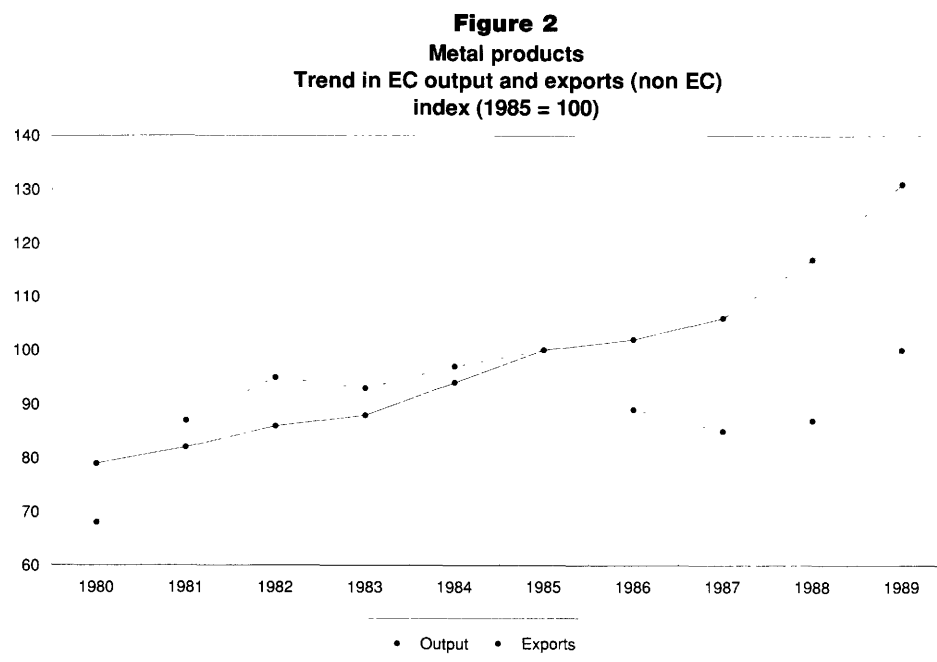
covered in subsequent years. In 1988, it reached an estimated 5,658 million ECU, i.e. a 44% increase in value since 1980 (except for Spain). The investment rate (investment divided by turnover) in 1988, however, was almost the same (3.9%) as that recorded in 1980 (4%). Investment was higher in West Germany and Italy, both export-orientated countries.

Structure of the industry

The EC metal products industry is composed of a large number of firms (roughly 40,000), mainly small or medium-sized, manufacturing a whole range of different products.

NACE 31 includes:

- ❖ 311: foundries
- ❖ 312: forging, drop forging, closed die-forging, pressing and stamping
- ❖ 313: secondary transformation, treatment and coating of metals
- ❖ 314: the manufacture of structural metal products (including integrated assembly and installation)
- ❖ 315: boilermaking, the manufacture of reservoirs, tanks and other sheet-metal containers



- ❖ 316: the manufacture of tools and finished metal goods except for electrical appliances (including, among others, hand tools, metal boxes, domestic heating appliances, kitchen appliances, metal furniture, etc.).
- ❖ 319: other workshops working metals not listed elsewhere.

The product range varies from nuts and bolts to metal packaging and metal furniture with castings.

The relative importance of the different sub-sectors varies considerably (see table 7). In terms of output and the number of people employed, the manufacture of tools and finished metal goods accounts for 37% of metal products as a whole, followed by secondary transformation (around 16%) and the manufacture of structural metal products (14%). The metal products industry features a large number of small firms. The average

Table 2
Metal products
Production, international comparison

(million ECU)	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989
Production in current prices										
EC Index	98 754 79	102 039 82	107 427 86	109 427 88	117 520 94	124 467 100	127 577 102	131 725 106	145 511 117	163 296 131
USA (*) Index	93 536 47	123 293 62	131 773 66	148 595 74	189 315 95	199 874 100	155 032 78	136 234 68	141 865 (*) 71	145 000 72
Japan (*) Index	34 137 46	46 306 62	46 933 63	55 628 74	64 657 86	74 998 100	79 608 106	81 989 109	101 004 135	109 133 146
EC production in constant prices Index	132 871 107	128 763 103	123 783 99	120 804 97	122 241 98	124 467 100	127 196 102	130 863 105	139 289 (*) 112	145 800 117

(*) Census of Manufactures and Eurostat estimates
(*) estimates
Source: Eurostat (Index)

Table 3
Metal products
EC trade in current value

(million ECU)	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989
Exports extra-EC (%)	9 458	11 814	12 959	12 735	13 191	13 652	12 345	11 837	11 860	13 627
Index (%)	68	87	95	93	97	100	89	85	87	100
Imports extra-EC (%)	3 285	3 447	3 718	3 928	4 479	4 809	4 642	5 100	6 146	7 266
Index (%)	68	72	77	82	93	100	104	114	128	151
X/M	2.88	3.43	3.49	3.24	2.95	2.84	2.66	2.32	1.93	1.88
Trade intra-EC (%)	7 528	7 645	8 267	8 750	9 703	10 879	12 796	13 754	16 107	18 767
Index (%)	70	70	76	80	89	100	109	117	148	172
Share of total (%)										

(1) 1980 EC9; 1981-85 EC10.
(2) Taking into account changes in EC membership
Source: ORGALIME, Eurostat (Comext)

number of employees per firm was estimated at 50 in 1988. The Eurostat figures for 1983 illustrate this structure, although according to more recent information from a number of different countries, the proportion of large firms is slowly increasing. If one includes the statistics for Portugal in the EC figures, however, the average size of companies within the EC would be smaller.

Geographical distribution

The European metal products industry encompasses a number of countries, even though 84% of the value of total output is concentrated in four: West Germany,

France, Italy and the United Kingdom.

If we add Spain to the list, 91% of output comes from just five countries.

The distribution by country is illustrated in table 9.

Over the past nine years, there have been no major changes in the distribution of output. Such a pattern clearly reflects, at least partially, the overall economic importance of the different Member States.

In order to avoid this bias, figure 4 indicates the importance of the metal products industry in the manufacturing industry as a whole for each individual country.

As in the case of mechanical engineering,

West Germany is both the EC's largest producer (35% of EC output) and the most highly specialised country. Next follows France (20%) and the United Kingdom (18%). Notably Italy is the fourth-largest EC producer in terms of importance, and is much less specialised than Spain, the Netherlands or Belgium. The distribution of employment appears fairly similar to that of output.

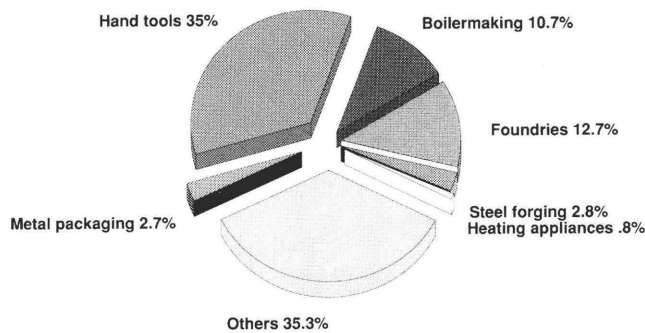
With regard to the rate of growth in output at constant prices between 1980 and 1988, Portugal and Spain experienced an average annual drop of 5.1% and 1.5% respectively; conversely, Denmark, France and Italy recorded higher annual growth

Table 4
Metal products
Employment by country, 1980-88

(thousands)	1980	1981	1982	1983	1984	1985	1986	1987	1988
Belgique/België	65.9	62.3	58.7	56.6	54.8	53.3	51.2	49.5	47.8
Danmark	26.4	23.3	22.5	22.5	24.6	27.3	29.3	30.3	28.2
BR Deutschland	823.6	799.6	766.1	728.2	717.6	726.9	741.6	736.5	737.6
Hellas	19.3	18.2	18.4	18.4	18.3	20.5	20.5	20.4	20.4
España	N/A	N/A	N/A	N/A	N/A	N/A	175	174.3	174.4
France	467	446.8	435.7	426	394.2	380.1	364.9	356.1	356.1
Ireland	13.2	12	11.5	9.5	8.3	7.6	7.2	7	6.8
Italia	248.1	237.9	225.3	280	268.6	228	217.2	216.4	216.4
Nederland	83.8	79.1	73.7	67.8	68.9	69.7	71.4	72.8	75.9
Portugal	81.7	84.7	85	68.1	58.4	52.8	48.8	48.6	48.6
United Kingdom	578	499	467	436	426	411	404	409	411
EC (%)	2 646.8	2 490.6	2 371.0	2 316.8	2 230.3	2 156.1	2 131.1	2 123.0	2 123.2

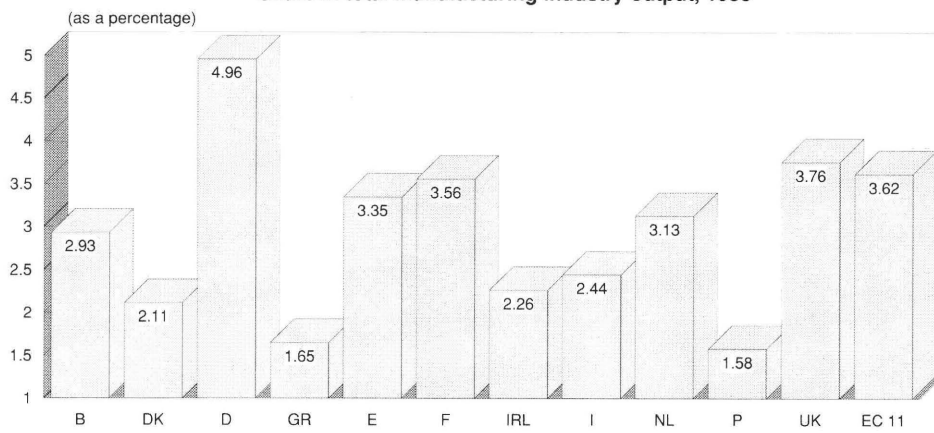
(1) 1980-85 Spain estimated by Eurostat.
Source: ORGALIME

Figure 3
Metal products
Composition of the industry: % of employment, 1988



Source: Eurostat, DRI Europe

Figure 4
Metal products
Share in total manufacturing industry output, 1988



Source: Eurostat, DRI Europe

Table 7
Metal products
Sectoral share of production and employment, 1987

NACE Code	Production (%)	Employment (%)
311	12	13
312	8	7
313	16	17
314	14	14
315	12	11
316	37	37
319	1	1
31 Total	100	100

Source: Eurostat (Inde)

over the same period (2.8, 1.8 and 1.8% respectively).

Prospects

In 1989, the metal products industry yielded good results. Real output improved by over 4.7%.

The sector's development however, is closely linked to that of the various down-

stream industries, such as carmaking, construction, mechanical and electrical engineering. As a large-scale consumer of energy, moreover, the industry is liable to suffer the consequences of any domestic fluctuations in energy prices.

It is clearly important that the EC should continue to improve its productivity in

Table 5
Production by employee
(1985 constant price)

(million ECU)	Production
1980	53.9
1981	51.7
1982	52.2
1983	52.1
1984	54.8
1985	57.7
1986	59.7
1987	61.6
1988	65.6
1989	67.3

(¹) Excluding Spain
Source: ORGALIME, EUROSTAT

Table 6
Metal products
Investment in the EC, 1980-88 (¹)

(million ECU)	Investment
1980	3 937
1981	3 612
1982	3 547
1983	4 035
1984	4 433
1985	5 046
1986	5 288
1987	5 336
1988	5 658

(¹) Excluding Spain
Source: ORGALIME

order to maintain a competitive advantage in terms of price and quality.

Growth is expected to continue over the next few years, albeit at a slower pace. Investment should increase while employment is expected to fall. All this indicates a continued trend towards improving production facilities in order to remain competitive and increase productivity.

Table 8
Metal products
Number of enterprises by employment band, 1983

(%)	20-99	100-499	500+	Total
EC (1)	81	17	2	100
Belgique/België	80	18	2	100
Danmark	80	19	1	100
BR Deutschland	73	23	4	100
España	84	14	2	100
France	83	15	2	100
Italia	88	11	1	100
Luxembourg	86	14	0	100
Nederland	83	16	1	100
United Kingdom	78	19	3	100

(1) Excluding Greece, Ireland and Portugal
Source: Eurostat (Inde)

Table 10
Metal products
Distribution of production by country,
1988

(%)	Share
Belgique/België	2.6
Danmark	1.4
BR Deutschland	34.8
Hellas	0.5
España	6.7
France	19.6
Ireland	0.4
Italia	11.7
Nederland	4.2
Portugal	0.4
United Kingdom	17.7
EC	100

Source: ORGALIME

Table 9
Metal products
Production by country, 1980-88

(million ECU)	1980	1981	1982	1983	1984	1985	1986	1987	1988
EC	98 754	102 039	107 427	109 152	117 520	124 467	127 577	131 725	145 511
Belgique/België	2 763	2 760	2 822	2 907	3 056	3 506	3 513	3 517	3 769
Danmark	1 043	988	1 102	1 204	1 493	1 791	1 955	1 987	2 000
BR Deutschland	32 681	32 838	35 250	36 485	39 387	41 808	46 240	47 297	50 720
Hellas	545	705	685	678	725	729	750	720	725
España	8 294	8 888	8 895	8 086	8 500	8 800	8 200	9 155	9 705
France	19 378	20 763	21 185	21 609	22 575	24 071	25 041	25 842	28 478
Ireland	409	406	429	458	530	573	560	560	612
Italia	10 706	11 108	11 426	12 365	13 678	14 248	14 379	15 280	17 080
Nederland	3 826	3 740	4 201	4 138	4 542	5 074	5 390	5 472	6 085
Portugal	539	639	665	614	591	662	581	530	550
United Kingdom	18 570	19 204	20 767	20 608	22 443	23 205	20 968	21 365	25 787

Source: ORGALIME

Table 11
Metal products
Production at constant value by country, 1980-88

(million ECU)	1980	1981	1982	1983	1984	1985	1986	1987	1988
EC	132 871	128 763	123 783	120 804	122 241	124 467	127 196	130 863	139 289
Belgique/België	3 583	3 321	3 222	3 176	3 231	3 506	3 375	3 343	3 648
Danmark	1 499	1 326	1 344	1 377	1 603	1 791	1 904	1 895	1 873
BR Deutschland	44 536	42 474	40 149	38 841	40 486	41 808	43 293	42 687	45 485
Hellas	801	875	759	720	705	729	809	819	777
España	10 444	10 344	9 708	9 435	8 889	8 800	8 375	9 401	9 254
France	26 152	27 141	25 253	24 248	23 367	24 071	26 573	28 425	30 061
Ireland	580	521	490	512	568	573	561	597	619
Italia	13 954	14 064	13 655	13 839	14 199	14 248	13 631	14 457	16 048
Nederland	5 073	4 778	4 738	4 439	4 725	5 074	5 077	5 007	5 493
Portugal	818	796	771	718	627	662	588	542	536
United Kingdom	25 431	23 121	23 695	23 500	23 841	23 205	23 010	23 691	25 496

Source: ORGALIME

Table 12
Metal products
Evolution of the sector
(million ECU, constant value 1985)

	1989	1990	1991/90 (%)	1992/91 (%)	1994/92 (%)
Production	145 800	149 500	2	2	2

Sources: Sema Management Group Consultants

Written by: Sema Group Management
 Consultants

The industry is represented at EC level by:
 ORGALIME: Organisme de liaison des industries
 métalliques européennes. Address: rue de
 Stassart 99, B-1050 Brussels;
 tel: (32 2) 511 34 84, telex: 21078,
 fax: (32 2) 510 23 01

As a result of the favourable overall economic development, foundries have been able to achieve quite high growth rates in recent years.

At 1985 constant prices, growth in 1989 stood at 7.1%. In terms of quantity, production rose by 5%. Casting production in the EC Member States amounted to 12 million tonnes in 1989, and thus attained a share of world production of around 20%.

There was a clearly recognisable trend in the 1980s towards higher-quality casting. This is especially evident in the constant development of the materials and the growing degree of difficulty regarding production in the foundries. The average value per tonne of cast metal, expressed in 1985 constant prices, rose by 4.4% between 1980 and 1989. This development was most apparent in the Federal Republic of Germany.

Since the market for cast products is not necessarily one of the markets with high growth rates, investments made in the past were intended less for capital expansion than for plant replacement, rationalisation and quality improvement, and labour productivity. In recent years an increasingly large proportion of the investments have been required for environmental protection.

Description of the sector

Foundries are chiefly industrial suppliers.

Cast products are for the most part semi-finished articles and are given their shape by metals in molten state being poured

into and solidifying in a mould.

The designer is in principle free to choose any desired shape. Both the surface and the cavities may be highly complex.

Various casting techniques are distin-

Table 1
Foundries - Main Indicators, 1980-90

(million ECU)	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990
Apparent consumption (1)	11 281	10 830	11 302	12 014	12 988	13 220	15 013	14 866	16 682	18 907	20 452
Net exports (1)	547	766	853	702	739	837	653	597	587	479	404
Production (1)	11 828	11 596	12 155	12 716	13 727	14 057	15 666	15 463	17 269	19 386	20 856
Employment (thousands)	379	346	333	315	300	283	277	271	270	275	N/A

(1) 1980 EC9; 1981-85 EC10

Source: Eurostat (Inde, Bise, Comext)

quished, depending on whether the molten metal is given the shape of the desired finished product under the effect of gravity, centrifugal force or pressure; sand casting, shell moulded casting, gravity die casting, pressure die casting, centrifugal casting, continuous casting, investment casting, precision casting and art casting.

Another way of classifying casting techniques is according to the materials used. This article and the NACE code are based on this sub-division. A distinction is made in NACE 3110 Casting Products between:

- ❖ Casting of iron and steel (NACE 3111);
- ❖ Casting of non-ferrous metals (NACE 3112).

Many firms in the car, mechanical engineering and plant engineering industries have their own foundries, which mostly cast items for in-house use. In these cases the foundry generally forms part of a larger business. On the other hand, if the foundry is independent, i.e. not vertically integrated, it offers its products to the market as a jobbing foundry, in most cases supplying components as a sub-contractor.

Development of production and consumption

Together with Greece and Ireland, for which no production figures are available, it is likely that the European Community produced more than 12 million t per year of cast products in 1989 for the first time

since 1981. The USSR and the People's Republic of China probably come second and third, ahead of the USA with 10.5 million tonnes and Japan with 7.4 million tonnes (1988).

This means that the three largest producers of castings in the world together account for around half the world production, or that the EC produces approximately 20% of all castings in the world. However, if the comparison is related not to weight but to the value of production, the share held by the EC is probably even larger. Industrialised countries are increasingly producing thin-walled and therefore lighter castings which are costly to shape, with a high proportion of cores. In addition, the proportion of non-ferrous and in particular light-metal casting is rising. The value of production of 19.4 billion ECU is therefore assuming increasing prominence.

By far the majority of casting production in the EC is accounted for by cast iron, cast steel and malleable cast iron, cast iron dominating with a share of two-thirds of the output. Within this group, ductile cast iron (cast iron with globular graphite) is showing particularly high rates of growth. The share of cast iron, cast steel and malleable cast iron production in total production has been falling since the beginning of the 1980s to the benefit of non-ferrous metal castings, the share of which in EC production increased from 12.6% to 17.6% between 1980 and 1989. This product

group is dominated by light-metal casting (principally aluminium and its alloys), which accounts for three-quarters of the output. Light-metal casting is continuing to develop rapidly.

More than 50% of all castings in the EC are made in the Federal Republic of Germany and France. If the production of Italy, the United Kingdom and Spain is added, five countries in the EC account for more than 90% of all castings produced in the EC. It is noticeable that despite prolonged and strong economic growth, the volume of production volume of 1980 was not reached again in 1989 in any of the five countries. This is yet more evidence of the shift within foundry production described above. Heavier products such as steel-works moulds are increasingly being replaced by complex light-weight components, such as automotive castings. However, this also shows clearly that economic growth can only be explained in part by the increased material production. It is characteristic of the technical progress in the casting industry that the cast components are becoming more light-weight as a result of higher performance materials and computer-aided design techniques, and that production in terms of tonnes is failing to match the actual demand for parts.

This is illustrated particularly clearly at a time of declining production by the rising proportion of cast iron production supplied to the car industry. In the Federal

Table 2
Foundries - Production, value added and investment

(million ECU)	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990 (*)
Production in current prices											
EC Index	12 839 84	12 770 84	13 381 88	13 812 90	14 925 98	15 283 100	15 666 103	15 463 101	17 269 113	19 386 127	20856 136
USA Index	12 749 58	16 253 74	14 535 66	16 238 74	22 244 101	22 026 100	16 480 75	14 540 66	15 142 69	16 177 73	N/A N/A
Japan Index	6 481 55	7 999 67	7 946 67	8 917 75	11 162 94	11 840 100	11 729 99	11 479 97	13 330 113	14 677 124	N/A N/A
EC											
Production at constant prices Index	18 935 124	16 954 111	16 198 106	15 519 102	15 746 103	15 283 100	15 266 100	14 678 96	15 896 104	17 053 112	N/A N/A
Production at thousand tonnes (*) Index	13 502 121	12 388 111	11 585 104	11 036 99	11 008 99	11 136 100	10 874 98	10 651 96	11 305 102	11 868 104	N/A N/A
Value added at current prices (*) Index	5 860 91	5 791 90	5 961 93	6 057 94	6 268 97	6 442 100	6 982 108	7 057 110	7 714 120	8 672 135	N/A N/A
Productivity (*) Index	21 88	22 92	22 92	23 96	23 96	24 100	26 108	27 113	28 117	30 125	N/A N/A
Investment in current prices (*) Index	638 102	527 84	498 80	529 85	583 93	626 100	714 114	796 127	N/A N/A	N/A N/A	N/A N/A

(*) excluding Greece and Ireland

(*) excluding Denmark, Greece, Portugal

(*) excluding Denmark, Greece, Netherlands, Portugal, Spain

(*) Estimated

Source : Eurostat(Inde), CAEF

Republic of Germany this proportion rose in the 1980s from 32 to 42% and in France from 45 to 61%. At the same time, however, the specific consumption of castings (cast iron) in vehicle engineering fell. This decline was partly to the benefit of light-metal castings, 80% of the production of which is now supplied to the car industry in France compared with around 70%. On the other hand, the replacement of castings by plastic is not as significant a factor as it was in previous years. The absence of pollutants and the full recyclability of cast metal has instead led to other materials being replaced by castings. The general lack of space for dumping in Europe will in future impose further restrictions on the use of plastics, which put a great strain on dumps. As in the car industry, the specific consumption of castings fell in mechanical engineering, the second largest customer of the casting industry. The shifts in the percentage shares are, however, less great.

At least in the Federal Republic of Germany, these shares remained virtually unchanged in the 1980s at just over 30% of deliveries of cast iron, cast steel and malleable cast iron. Whilst output fell from 13.5 to 11.9 million t between 1980 and 1989 or by 12%, the value of production in 1985 constant prices only declined from 18.5 to 17.0 billion ECU or by 8%. This means that in 1985 constant prices the average revenue per tonne of casting rose from 1370 ECU in 1980 to 1430 ECU in 1989, or that a distinct move towards higher-quality castings took place in the 1980s. This development is most pronounced in the Federal Republic of Germany. With the exception of Italy, all the other important European producer countries show a downward trend in the average value of production. In addition, the Federal Republic of Germany is the only country in the EC to have achieved a significant rise in the value of production

compared with 1980, expressed in constant prices: from 5.5 to 6.8 billion ECU. Only the Italian industry, assisted by the favourable economic climate, was otherwise able to match the level of production achieved in 1980. All the other leading producers in the EC show clear declines.

Developments in international trade

Foreign trade in cast products is not fully recorded. Firstly, only "direct" exports are recorded. For example, none of the cast products fitted into cars as components and then exported are being included in the statistics. Secondly, many cast products, particularly components for the car industry, which in some cases have shown high rates of growth, do not have their own product figures in the foreign trade statistics. They are recorded under "miscellaneous products". Imports rose in 1989 to 2.0 billion ECU and exports to 2.5 billion ECU.

Table 3
Foundries
EC trade in current value

(million ECU)	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990 (*)
Exports extra-EC (1)	783	1005	1103	809	911	975	952	911	944	982	978
Index (2)	79	103	113	83	93	100	94	90	93	97	100
Imports extra-EC (1)	312	319	327	328	364	414	377	388	447	526	574
Index (2)	75	77	79	79	86	100	89	92	106	124	138
X/M	2.51	3.15	3.37	2.46	2.51	2.35	2.53	2.35	2.11	1.87	1.7
Trade intra-EC (1)	702	670	700	699	780	891	1095	1099	1250	1458	N/A
Index (2)	79	75	79	78	87	100	116	117	133	155	N/A
Share of total (%)	49.9	42.7	41.3	53.2	51.6	54.5	55.2	56.3	58.4	59.3	N/A

(1) 1980 EC9; 1981-85 EC10*

(2) Taking into account changes in EC membership

(*) Estimated

Source: Eurostat(Comext)

By far the greater part of this trade takes place between the individual Member States of the EC. The proportion is 75% for imports and 60% for exports. Measured in terms of consumption in the EC, imports attain a share of around 10%. Less than 3% are imported from countries outside the EC. The proportion of production exported is 13%. Although the "direct" foreign trade in cast products is not of outstanding importance, there was nevertheless a noticeable shift between 1986 and 1989. Whilst the value of cast products exported to countries outside the EC was 2.5 times higher than imports from third countries in 1986, it had fallen to 1.9 times in 1989. The share of imports from third countries in consumption rose from 2.5 to 2.8% over the same period. In other words, the international competitiveness of the casting industry in the European Community against third countries has declined in recent years. This is true for all the leading producer countries as well as for the EC as a whole.

Development of employment in the casting industry

Output fell by 11.8% in the five major countries of the EC over the period from 1980 to 1989, but the number of employees

dropped by 30%. This means that the average quantity produced per employee rose from 36.4 tonnes to 45.7 tonnes or by 25.5%. If the average output per employee is considered, the rate of increase is even more apparent.

At 1985 constant prices, a worker in the casting industry in 1980 on average produced castings to the value of 50 400 ECU, and in 1989 to the value of 65 700 ECU. This corresponds to an increase of 30.4%. The advance in productivity has evidently been greatest in the Federal Republic of Germany. The output per employee appears to have risen by 52.3% between 1980 and 1989. A rise of 18.4% was achieved in France and 17.2% in the United Kingdom. According to a survey by the European Federation of Foundries (CAEF), wages are highest in the Federal Republic of Germany. Including incidental expenses, namely holiday pay and insurance, the average hourly wage of a worker stood at 17.33 ECU in October 1989. The equivalent values are 14.35 ECU for Italy, 12.33 ECU for France and 7.53 ECU for the United Kingdom.

Investments

When an unfavourable assessment was made of future economic trends in the

early 1980s, investments were also low and, measured in terms of turnover, falling. Conversely, when the economic upturn also benefited the casting industry in the mid-1980s, investments and their share in turnover rose again. In the Federal Republic of Germany they reached their highest value so far in the 1980s in 1987, at 5.8% of turnover. Measured in terms of turnover, they were only higher as an average figure for the 1980s in Italy, although they dropped back to 4.6% again in Italy after a sharp rise from 3.6% in 1983 to 5.7% in 1986. The investment rate is lowest in comparison with the four leading producers in the EC in the United Kingdom, where it did not reach 4% of turnover, even during the period of the economic upturn. Since no further sharp increase in foundry output is to be anticipated in the long term, foundries are concentrating their investment activity on the introduction of modern plants. The aim, apart from replacing old machinery with new, is generally to continue the rationalisation and automation of production and in so doing to increase labour productivity. Investments in environmental production should not be disregarded, however.

Table 4
Foundries - Production by type of metal used, 1988

(thousand tonnes)	B	D	E	F	I	L ⁽¹⁾	NL	P	UK	EC ⁽²⁾	JAP
Grey iron	129	2 304	437	980	1 287	53	116	49	745	6 100	3 789
Nodular and malleable iron	16	1 009	190	823	227	24	56	29	399	2 773	2 076
Steel	46	221	87	126	95	5	3	14	112	709	434
Total ferrous metals	191	3 534	714	1 929	1 609	82	175	92	1 256	9 582	6 299
Cu-Base	2	80	15	23	85	2	2	2	42	253	106
Al-Base	15	471	81	224	392	11	15	5	78	1 292	919
Other non-ferrous	2	78	25	43	87	2		2	44	263	95
Total non-ferrous metals	19	629	121	290	544	15	17	9	164	1 808	1 120
Total	210	4 163	835	2 219	2 153	97	192	101	1 420	11 390	7 419

(1) Estimated

(2) Denmark, Ireland and Greece not available.

Source: CAEF

Table 5
Foundries
Production by country, 1980-89

(million ECU)	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989
EC	12 839	12 770	13 381	13 812	14 925	15 283	15 666	15 463	17 269	19 386
Belgique/België	251	246	204	206	246	276	281	283	299	343
Danmark	100	97	98	107	119	136	138	135	151	165
BR Deutschland	4 567	4 585	4 616	4 836	5 266	5 752	6 208	5 793	6 298	7 054
Hellas	18	29	30	30	31	30	30	23	28	25
España	850	997	1 055	933	1 032	1 044	1 041	1 130	1 297	1 573
France	2 747	2 879	2 941	2 799	2 698	2 704	2 744	2 715	2 970	3 350
Ireland	40	27	23	21	25	28	32	31	33	35
Italia	1 510	1 466	1 881	2 554	2 862	2 525	2 706	2 827	3 203	3 737
Luxembourg	34	32	33	39	63	62	61	59	69	74
Nederland	190	191	228	230	246	274	292	240	261	235
Portugal	143	178	172	163	166	182	158	198	203	223
United Kingdom	2 389	2 043	2 100	1 894	2 171	2 270	1 975	2 029	2 457	2 572

Source: Eurostat (Inde)

Table 6
Foundries
Production at constant value by country, 1980-89

(million ECU)	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989
EC	18 935	16 954	16 198	15 519	15 746	15 283	15 266	14 678	15 896	17 053
Belgique/België	353	321	245	230	258	276	277	275	288	320
Danmark	146	126	117	119	125	136	132	125	134	140
BR Deutschland	5 526	5 219	4 992	5 062	5 381	5 752	6 214	5 788	6 211	6 770
Hellas	47	60	52	41	36	30	24	16	17	13
España	1 498	1 533	1 418	1 119	1 112	1 044	956	987	1 081	1 227
France	4 340	4 012	3 664	3 181	2 857	2 704	2 671	2 564	2 732	2 972
Ireland	71	40	29	24	27	28	30	29	30	31
Italia	2 873	2 369	2 609	3 089	3 125	2 525	2 558	2 549	2 749	3 018
Luxembourg	48	42	40	44	65	62	61	59	68	71
Nederland	233	219	247	243	251	274	291	240	260	231
Portugal	407	421	331	252	198	182	142	162	152	148
United Kingdom	3 393	2 592	2 454	2 115	2 311	2 270	1 910	1 884	2 174	2 112

Source: Eurostat (Inde)

Table 7
Foundries
Employment trends, 1980-89

(thousands)	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989
EC	379.2	346.2	332.8	314.5	300.4	283.2	276.6	270.6	270	274.7
BR Deutschland	117.1	113.6	104.8	98.8	97.7	100.3	100.9	93.7	94.3	95.3
France	73.3	67.9	65.7	62	56.4	47.3	44.9	43.1	42.8	43.3
United Kingdom	93.3	71.9	63.8	52.3	51.6	48.2	46.6	47.2	48.9	49.1
Italia	36.9	35.1	43.5	48.8	43.4	38.5	35.8	35.6	34.9	35.2

Source: Eurostat (Inde)

These have now reached a share of more than 10% of total investments in the Federal Republic of Germany.

Structural change

The casting industry has retained its medium-scale character to date. More than half of all foundries continue to employ less than 50 workers. Automatic moulding plants have been developed for large production runs, and require multiple shift operation if they are to be used efficiently. Businesses employing 1000 or more are therefore appearing. This is true particularly of foundries which have specialised in the production of automotive castings. Further evidence of the medium-scale character of the casting industry is provided by the pattern of ownership; independence and family ownership are common. Even so, it retains the character of a sub-contractor industry.

Castings are often produced primarily for "in-house requirements", even in family businesses, because the company needs cast components for its mechanical and plant engineering activities. Even where foundries are subsidiaries of large groups, the size of the business has often only changed when this is necessitated by the economic use of modern technology. The foundry has otherwise continued at its previous size as a profit centre.

There are two major reasons for foundries to be taken over and incorporated by

(large) groups; either the need for cast components for the company's production programme, in other words the aim of achieving independence from other (outside) sub-contractors, or the objective of being able to offer the whole range of foundry technology under one roof, from light-metal to high-grade steel castings, from hand-moulded castings to those moulded on automatic machines, from heavy casting to investment casting using the lost wax process.

Regional concentration of the casting industry

In the past, many foundries were set up close to coal mines, or near to iron and steel production. In other words, the locations of foundries were and still are directed towards the raw materials. However, instead of the raw materials, the locations are now increasingly determined by the customers.

Cooperation between the foundry and the customer has become more important as the demands made on the castings have become more stringent, and "just in time" delivery of large numbers of items has been required.

The most important locations for the casting industry in Europe now are therefore where the car and mechanical engineering industries are gaining in importance.

Other factors

Ecology Recycling has always been a significant factor in the casting industry.

This is particularly true of the most important materials used; the sands and the metals. Sands are re-conditioned and metals re-melted as scrap. Used cast products are also returned to the production cycle. It is nevertheless impossible to avoid waste completely. Some residues, particularly thermally worn moulding sands, which have to be dumped, will always exist. The casting industry is nevertheless working on economically sound methods for further reducing the quantities of residues.

The prime concern of foundries in their environmental protection work at present is clean air, particularly to eliminate dust. Strict conditions laid down in regulations must be complied with, and high investments are necessary in some cases. Noise pollution (in the fettling shop) and air pollution problems in particular are likely to have to be addressed in the area of industrial safety.

The profitability of many foundry businesses would deteriorate if they were unable to pass the increased costs due to environmental protection measures to their customers. Harmonisation of environmental protection requirements with a view to the single market should also contribute towards ensuring fair conditions for competi-

Table 8
Foundries
Investment trends

(million ECU)	1980	1981	1982	1983	1984	1985	1986	1987
BR Deutschland	203	169	171	211	201	242	305	358
% of turnover	4.2	3.5	3.5	4.2	3.8	4.0	4.7	5.8
France	139	130	109	98	80	113	101	117
% of turnover	5.0	4.4	3.6	3.5	2.9	4.1	3.7	4.3
Italia	101	102	74	93	125	119	155	136
% of turnover	6.6	6.9	3.9	3.6	4.3	4.7	5.7	4.6
United Kingdom	116	65	66	58	68	83	72	82
% of turnover	4.7	3.1	3.1	3.0	3.1	3.6	3.6	4.0

Source: Eurostat (Index)

tion between the individual locations and Member States.

1992 Even today very few significant problems are encountered in trading in castings across national boundaries within the European Community.

The ending of Customs formalities or waiting times is therefore not likely to have any major effect on the international trade in castings. On the other hand, the international placing of public contracts is likely to have a greater effect. This is likely to apply particularly to pressure pipes and sewer castings. It is likely that de-regulation in the transport and insurance sectors will also have an effect.

All this will further reinforce the trend which already exists, towards buying and selling globally. However, since the market for cast products is not necessarily one of the growth markets, the formation of the single market will primarily increase the mutual competition between the foundries of the various Member States.

Technical Innovations Large series casting became possible as a result of the automation of sand conditioning and the invention of automatic moulding plants, and a little later the continuous casting of moulds as a result of the development of holding furnaces. The induction crucible furnace finally made batch operation possible and could be used both as a melting furnace and as a

holding furnace. Finally other production sequences were automated and (labour) productivity was further increased as a result.

At present it appears that the introduction of computer-aided design and manufacturing (CAD and CAM) could give considerable further impetus to the increase in productivity. Pattern-making and/or the fettling shop would be particularly affected, both of which have to date remained labour-intensive areas of production.

At the same time, new materials which meet the increasingly exacting demands of the consumers of castings are constantly being developed. Mention should be given in particular to the increased demands made on:

- ◆ heat resistance;
- ◆ wear resistance;
- ◆ rust/acid resistance.

On the other hand, some castings will become ever smaller, lighter and thinner, but in some cases ever larger and heavier. In addition, the dimensional tolerances to be respected by foundries have also been made narrower in many cases. All these developments, often pointing in different directions, have resulted in foundries becoming increasingly heterogeneous.

Competition to and possible substitutes for cast products Casting as a master pattern process is in direct competition with sintering, but also in particular with

the methods of metal forming, especially forging, as hammer or die forging, rolling, pressing, drawing and deep drawing. Mention may also be made of the joining techniques, such as welding, bonding, riveting and screwing. In recent years, however, the mutual competition between various materials has been of far greater importance. This is particularly true of plastics. Their share in vehicle engineering, in the area of household articles, pipes or fastenings has increased constantly in recent years, to the detriment of metals.

It appears at present that this process of substitution is slowing down. The reasons for this are without doubt the requirements to be met by the material, such as weight, wear resistance etc. on the one hand, but also the price of the material, ageing behaviour or the possibility of recycling on the other. It is likely that mineral products such as ceramics or composites will increase in importance in the future. Whether they become established depends largely on the price at which they are offered and whether the materials can meet the requirements set for them.

Outlook

Since foundries do not make any final products, they are heavily dependent on the demand from the processing industry. This is true particularly of the car and mechanical engineering industries.

The favourable development in the economic cycle in recent years also enabled the foundries to achieve high rates of growth. Production was increased by 5% in terms of quantity in 1989 and by as much as 6.9% in terms of value, at 1985 constant prices. Further growth of around 2% each is expected for the current year and next year.

In the long term it is likely that dependence on the car and mechanical engineering industries will continue to increase. On the other hand, it can be assumed that an ever smaller proportion of foundry production will go to the steel and building industries. On balance it is likely that the present level of production will continue to be achieved in terms of quantity in the long term.

Excess capacity is continuing to pose problems to the casting industry.

There are also cheap imports from third countries, particularly Eastern Europe.

Foundries have various options for attaining a better market position.

Firstly they can further increase quality, e.g. through new materials. They can also offer more services, such as finishing, and thus increase the value added.

In addition, increasingly complex designs can be developed. Steering knuckles for

the car industry, for example, could not be cast a few years ago.

And no less significant is the possibility, at least in some areas, of offering cast products for the end-user. Castings for sanitation and sewerage, but also lamp-posts or bells, are examples of this.

The international competitiveness of the European casting industry can be regarded as adequate. Evidence of this is provided by the high export surpluses in relation to third countries.

Particular advantages are proximity to the customer, the possibility of supplying large series "just in time" to the customer's production line and not least the high level of quality already achieved. Some production sequences which at present are still quite labour-intensive, such as pattern-making, fettling or finishing, are likely to be further rationalised and automated by CAD/CAM (Computer aided design, Computer aided manufacturing) over the next few years.

This ought to result in a substantial reduc-

Table 9
Foundries
Forecasts

(million ECU)	1989	1990	1991/90	1992/91
Production at current prices ⁽¹⁾	19 386	20 856	+7%	+6%

⁽¹⁾ 1991/90 and 1992/91: % of variation
Source: Eurostat (Inde, Bise, Comext)

tion in unit labour costs and a consequent improvement in international competitiveness.

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Revised by: European Research Associates

With production valued at approximately three billion ECU in 1989, the European forged steel industry takes prime position among Western nations, surpassing even Japan and the United States. The automotive industry is the forging industry's main customer, consuming more than 55% of the total production.

The production of forgings has increased by 2% in the course of the past three years.

Description of the sector

Forging consists of taking a piece of semi-finished steel (a "slug"), heating it until it becomes malleable and then forming it in a die, the two halves of which are brought together more or less rapidly in forging hammers or presses. The semi-finished steel products used by the forge are generally supplied to it in the form of round or four-square section billets and heavy gauge sheet metal.

The latter are formed either by the rolling of blooms or by continuous casting with or without a rolling operation. These semi-finished products are subsequently sawn or cropped depending on the thickness of the billets and are transformed into "slugs". Their length and weight are determined as a function of the specific characteristics of the finished forging. The types of steel which are forged are mainly carbon or mild steels, low grade alloy steels and high-alloyed steel grades. Stringent regulations govern the grade of steel specified for a given forged component. This grade will depend on the environment within which the component is to be used, the size and shape of the component, its machinability, the desired mechanical properties and the heat treatment which it is required to undergo.

Production

Between 1980 and 1986 the forging industry went through a period of overcapacity and recession, but production stabilised in 1987 and even started to recover towards a satisfactory level in 1988 thanks to an increasing specialization on the part of companies, to new technologies and also to a squeeze on operating costs by iron and steel producers. By 1989 the level of production (1.936 million tonnes) had virtually reached that of 1980 (2.040 million tonnes). This recovery situation varies from one country to another: the Federal Republic of Germany, Belgium and Spain suffered few of the effects of the crisis and have already regained their 1980 production level. France, the United Kingdom and especially Italy on the other hand are left with a volume of production still down on the level enjoyed at the beginning of the decade.

Consumption

Apparent consumption attained 1.767 million tonnes in 1989. Forgings are used in virtually every industry: automotive, aerospace, shipbuilding, plant and equipment, agricultural machinery, mechanical and electrical engineering (in conventional

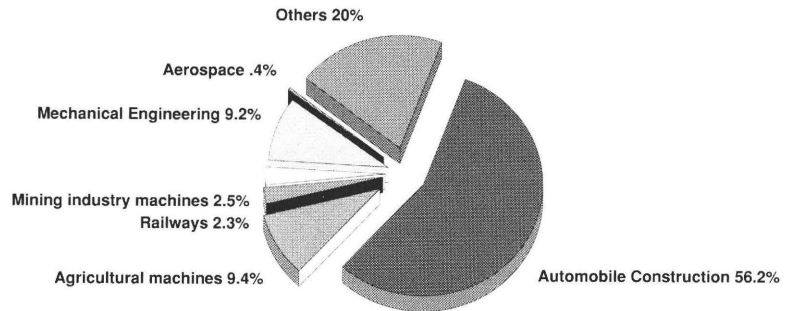
power stations as well as nuclear power plants). The motor industry is the most important customer however, representing 67.4% of the total in the Federal Republic of Germany, 41.7% in the United Kingdom, 37.9% in France and 43.7% in Italy. Many safety-critical components for steering and transmission systems are forged.

Productivity

Faced with growing pressure from competing production technologies and pressure on the part of customers to reduce prices, the forging industry in all EC countries have made major efforts aimed at increasing productivity:

- Investment in high-output machinery;

Figure 1
Steel forging
EC independent steel forging companies' deliveries by market, 1988



Source: Euroforge

- Expansion of the induction heating process;
- Mechanisation and robotisation of work stations;
- Introduction of CAD/CAM (Computer Aided Design: Computer Aided Manufacturing);
- Manufacture of lightweight components.

Table 1
Steel forging
Main indicators, 1980-90 (1)

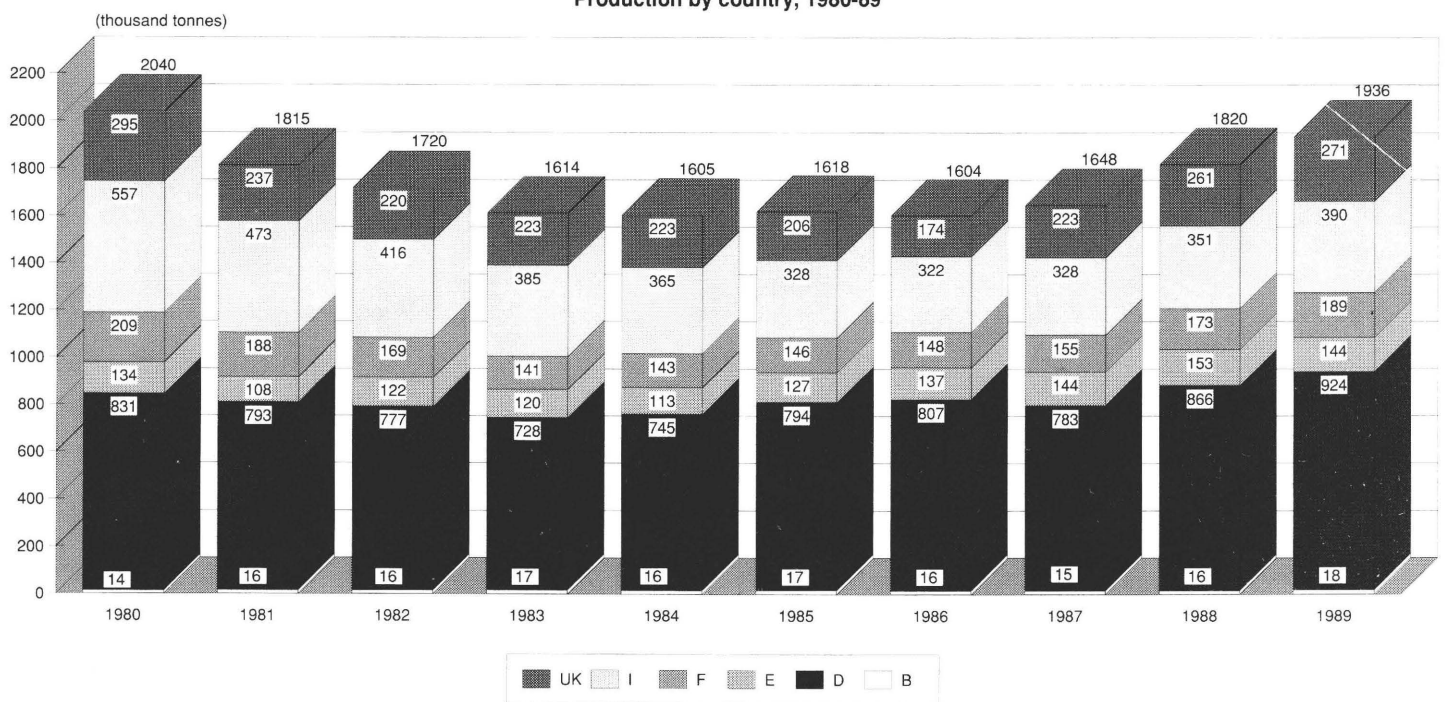
(thousand tonnes)	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990(2)
Apparent consumption	1 946	1 714	1 610	1 496	1 455	1 368	1 367	1 421	1 649	1 767	N/A
Net exports	94	101	110	118	150	250	237	227	171	169	N/A
Production	2 040	1 815	1 720	1 614	1 605	1 618	1 604	1 648	1 820	1 936	2 020
Employment (thousands) (2)	65	63	62	59	58	56	56	54	55	57	58

(1) F.R. Germany, Belgium, Spain, Italy, France and United Kingdom.

(2) estimated figures

Source: Euroforge, Eurostat (Comext)

Figure 2
Steel forging
Production by country, 1980-89



Source: Euroforge

Investments by the most efficient and most productive companies represent over 10% of turnover and have led to improved productivity and a reduction in manufacturing costs. The raw material for forging constitutes a substantial cost factor that is virtually impossible to cut down on (at least 35%). The other cost factors are labour (45%), energy (8%) and overheads (12%). These percentages obviously vary according to the weight and the grade of the steel used as well as the treatment and shape of the component to be produced.

In 1980 the per capita production ratio stood at 31,400 tonnes per employee.

In 1989 it had risen to 34,000 tonnes per employee for a more or less unchanged volume of production. In fact, after dropping from 1980 to 1986 as a result of a decrease in production, the number of jobs started to rise again in 1987, albeit at a slower rate than production. The industry employed 57,000 people in 1989.

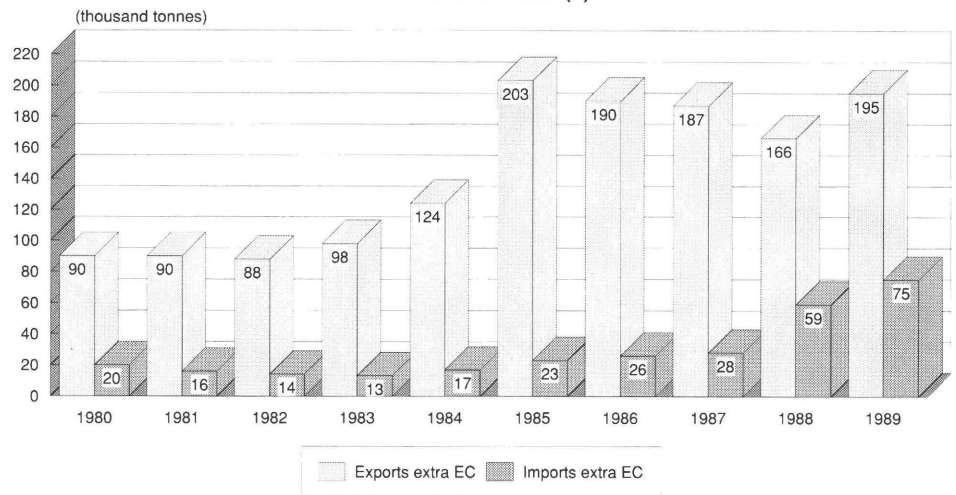
Structure of the Industry

This report makes no mention of the Netherlands, Ireland, Denmark, Greece or Portugal because these countries have no indigenous iron and steel industry.

In the Federal Republic of Germany (with 48% of production in the EC), 150 firms produce what amounts to the highest level of production in the western world. A number of important firms are active in this country, of which Thyssen, Gerlach and Peddinghaus are but a few.

In Italy (20% of EC production), most companies are located in the north of the country, in Piedmont, around Turin, in Lombardy, in the regions around Como, Varese and Brescia, and Veneto and Emilia (Bologna). The major companies include Teksid, a subsidiary of Fiat (90% of its

Figure 3
Steel forging
External trade (1)



(1) 1980: EC9, 1981-1983: EC 10
Source: Eurostat (Comext)

production is supplied to the motor industry, the Erber group, Riganti and Casartelli. In Lombardy, 10% of forges account for 50% of overall production and, with the exception of Teksid, these are all family businesses.

In the United Kingdom (14% of EC production), the largest company is United Engineering & Forging (formerly GKN), which represents 50% of U.K. production. The other important groups are: Firth Rixon, the INCO group and Cameron Iron Works. In France (10% of EC production), 72 companies are active in the forging sector.

Three groups, one of which has been created recently, dominate the sector: Ascométal, the Forges Stéphanoises and the Forges de Courcelles. Forging companies tend to be distributed among the regions of France as a result: 25 in the Ardennes, 6 in the Loire, 14 in the East of the country, and 27 in the other regions.

In Spain (7% of EC production), of the 40 firms which represent the forging sector only eight have over 150 employees, five employ between 100 and 150, nine between 50 and 100, and eighteen employ

fewer than 50 persons. The majority of these firms (30) are located in the Basque Region, four are in Catalonia, two in Aragon, one at Madrid, one in Galicia and two in the other regions. The most important companies are: Patricio Echeveria SA, La Forga Casanova SA, Forgas de Villalba SA (Gekanor group) and the Forgas de Galicia SA.

In Belgium (1% of EC production), ten firms are active in this sector, four of them with forging as their main activity. These ten firms are small or medium size businesses and most of them are concentrated around the towns of Charleroi and Liège that once represented the heart of the heavy engineering industry, such as coal and steel. The decline in some customer sectors (such as coal, steel and the railways) plus competition from products manufactured by alternative methods have brought about a substantial reduction in the number of firms active in this sector. Of those which survive, many have specialised in the manufacture of forged steel for high potential sectors such as mechanical engineering, truck manufacture and

Table 2
Steel forging
Production forecast

(thousand tonnes)	1989	1990	1991/90	1992/91
Production	1 936	2 020	+2%	+2%

Source: Sema Group Management Consultants

aerospace.

External Trade

The net exports of forged products represent 9.3% of the production of the member countries. During the period 1985-1989, exports expanded at a slightly faster rate than production. Nevertheless imports continue to grow at a faster pace than exports, as Figure 3 illustrates.

Outlook

The process of specialisation in forging is set to continue and intensify. A further tendency which will shape the structure of the sector in the medium term is competition between this sector and other production techniques as influenced by the technological options available to customers. Finally, imports are likely to increase and to alter market conditions. The medium term outlook will depend di-

rectly on the technological options available to clients (primarily the motor manufacturers) and on the quality/price ratio of forged products.

Competition between forges and other manufacturing techniques has compelled firms in the forging sector to implement an increasing number of innovations. While production in Germany and Belgium has remained stable over the past few years, elsewhere companies have struggled to prevent cuts in production. The forgings market is much coveted by the champions of competitor technologies and the battle is far from over. In this sub-contracting business where relations with clients are of the utmost importance, a certain geographic proximity has always existed. Imports from distant suppliers such as Brazil for instance are now beginning to appear,

and other countries could have plans to penetrate the European market. However the forging industry has implemented a number of measures in the areas of quality, productivity, improvements in service and the reduction of costs in order to fend off these potential challenges.

Written by: Sema Group Management Consultants

The industry is represented at EC level by: Euroforge: Liaison committee of European stamping and forging industries. Address: Goldene Pforte 1, Postfach 3823 D-5800 Hagen-Emst; Tel: (49) 2331/51041-45; Telefax: (49) 2331/51046

The importance of the constructional steel industry within the EC can be estimated on the basis of the total tonnage of steel used, i.e. over 4.5 million tonnes, which corresponds to an estimated value of between 6 and 8 billion ECU.

The industry provides 200,000 direct jobs and up to three times that number of indirect jobs, in related activities.

The EC is also one of the leading world consumers of constructional steel, as shown by the size of its market (4.5 million tonnes) compared with those of the United States (5 million tonnes) and Japan (8 million tonnes).

Definition

Firms' activities include the design of constructional steel works, the in-plant manufacture of components and sub-assemblies and their on-site assembly. Steel is the sector's basic material. The various products manufactured from constructional steel are as follows: buildings (industrial and other types), pylons, hoppers, silos, framework, bridges and platforms, frames lifting gear, cranes, elevators and conveyors, water damming equipment, etc.

Current situation

Table 1 describes the market for constructional steel used in industrial, commercial and agricultural buildings, bridges and hydraulic constructions, for certain member countries of the European convention for constructional steel (ECCS), i.e. all the EC countries except for the Iberian peninsula. Off-shore construction is not included in these total figures.

In 1989, almost every Member State saw a sharp increase in the construction of

non-residential buildings, which constitute the main market for constructional steel.

The current situation can be summarised as follows:

- ❖ total production stands at around 4.5 million tonnes;
- ❖ industrial construction accounts for approximately 55% of this total production;
- ❖ the construction of bridges, in spite of the large scale of such projects, accounts for around 4% of total production;
- ❖ the specialist market for pylons - mainly power supply - accounts for roughly 3%;
- ❖ the largest producer among the EC Member States is the United Kingdom. In 1989 its production reached record levels (10% up on 1988). This growth reflects a combination of massive expansion in the construction of offices and retail shops and spectacular growth on the part of the steel market compared with rival materials. In 1989, the U.K. accounted for approximately 30% of EC production (excluding Spain, Portugal, Greece, Ireland);

Table 1
Constructional steelwork
Production of constructional steel for the domestic market, by country and type of use (1)

(Thousand tonnes)	B/L	DK	D	F	I	NL	UK
	1989	1989	1989	1988	1989	1987	1989
Industrial uses (2)	126	14	699	395	N/A	N/A	745
Commercial	9	3	226	121	(*) 345	(*) 319	453
Other public uses	6	0	64	20	N/A	N/A	45
Agriculture	6	6	64	45	70	130	63
Pylons and towers	10	12	(*) 47	57	25	14	2
Bridges and hydraulic machines	9	7	N/A	30	40	55	36

(1) Except for power stations. Domestic use is negligible.
 (2) Including steel frames for factories
 (*) This figure refer to all the pylon, tower, bridge and hydraulic machinery sectors.
 (*) These figures refer to all industrial, commercial and other uses.
 Source: CECM

❖ The main consumers are the United Kingdom (1,344,000 tonnes in 1989), West Germany (1,100,000 tonnes in 1989), the Netherlands (717,000 tonnes in 1989), France (683,000 tonnes in 1988) and Italy (480,000 tonnes in 1989).

External trade is largely made up of intra-EC trade. Statistics are not available because exports of constructional steel are not identified as such. Instead, they are often included in imports-exports of finished works.

Italy is the largest exporter (110,000 tonnes) followed by West Germany.

Table 2 describes the market position of steel for a number of States which belong to the ECCS.

❖ in the case of single-storey industrial buildings, steel has a fairly high market

share. Italy is the only country where the market share is small;

❖ as regards commercial buildings, the United Kingdom is the only country where the steel industry commands a large share of the market;

❖ as regards bridge construction, France is the only country where steel has a large market share;

❖ the successful expansion of the market for multi-storey buildings in the United Kingdom and the market for bridges in France indicates that there is still considerable room for improvement as regards the market share of steel in other countries.

Small firms still account for more than 3/4 of all firms. The average size of firms is around 35 to 40 employees and production stands at around 1,500 tonnes, giving

an average turnover of approximately 2.5 million ECU.

Production by country

The United Kingdom Following a severe drop during the 1970s and early 1980s, the British steel industry has recently witnessed a major upturn in several sectors of the market.

There has been a remarkable upsurge in demand for commercial buildings and shops (as the retail trade has tended to shift to out-of-town sites). Demand for office space has increased substantially, particularly in the Greater London area.

In recent years steel has increased its share of the market in commercial buildings, from 33% in 1980 to 55%, based on the floor area of the building.

The industrial building market has been subject to marked cyclical changes,

Table 2
Constructional steelwork
Market share of steel

	Belgique/België Luxembourg	Danmark	BR Deutschland	France	Italia	Nederland	United Kingdom
Single-storey industrial and commercial buildings	High	Average	Average	High	Low	High	High
Multi-storey institutional buildings	Low	Low	Low	Low	Low	Low	Average
Bridges	N/A	Low	Low	High	Average	Average	Average

Notes:
 High: over 60 %
 Average: from 25 of 60 %
 Low : Below 25%
 Source :CECM

although the trend for 1988 was positive. Demand for buildings for small-scale plant and high-tech industries has grown recently. Steel has managed to retain a market share of approximately 90% in this particular sector.

One of the main reasons for the successful recovery of steel production in the United Kingdom has been the introduction by British Steel of major programmes aimed at developing the market for constructional steel. The volume of steel exported stood at around 49,000 tonnes in 1989, i.e. 3.5% of production.

The prospects, in terms of volume, for the years ahead are less promising, and 1990 is expected to see a decline, brought about by saturated demand for offices and buildings for the retail trade, as well as the downward cyclical trend in industrial construction. The most obvious constraint on the market share of steel is its rising price on world markets.

West Germany Production of constructional steel fell by some 30% between 1980 and 1985. Production then recovered, particularly from 1986 onwards, thanks to various projects involving the desulphurisation of gases emitted by power station chimneys. Between 1988 and 1989, it grew by 5%. Consumption of constructional steel for bridges declined from 54,000 tonnes in 1979 to 21,000 tonnes in 1984. Over the past few years, however, it has recovered slightly, reaching 47,000 tonnes in 1989. The market share of steel in industrial and commercial construction is a mere 40%. The constructional steel industry in West Germany is currently suffering from 20% overcapacity.

The use of composite constructional steel, mainly for commercial buildings, is limited,

but its market share may well increase. Attempts to broaden the distribution of such materials are hampered by a lack of information for users regarding their performance and use.

In West Germany there are a number of producers from Eastern Europe, offering highly competitive prices on the constructional steel market.

In 1987, West Germany exported 79,000 tonnes of constructional steel (8.5% of production) and imported 87,000 tonnes (9.5%).

France Between 1973 and 1987, France witnessed a sharp reduction in its production of constructional steel. This was mainly due to the general economic crisis, and the lack of large-scale industrial investment. Production picked up in 1988, to reach 683,000 tonnes in 1989, i.e. a 13% increase compared with 1988.

In a number of sectors, however, the market share of constructional steel could be improved. The main such sector is industrial buildings, where steel continues to command a large share of the market (over 75%). A growing number of bridges are now built from steel. Forecasters are expecting a 3 to 5% increase in annual tonnage in the case of non-residential and non-industrial buildings with more than one storey.

As in many other countries, the French iron and steel industry has changed drastically over the past fifteen years. In 1986, its four largest firms, each producing over 15,000 tonnes, accounted for 13.5% of total production of constructional steel. On the other hand, some 369 firms, each producing less than 2,000 tonnes, accounted for 35% of this total. Overcapacity in the French iron and steel industry is generally

estimated at 30%.

The main French contractors tend to specialise in concrete. Fire prevention and problems with corrosion have hindered any increase in the use of steel. A major information campaign is now under way in order to promote the use of steel in the years ahead.

France exports approximately 10% of its production, mainly on African and Middle Eastern markets. Its exports are on the decline.

Italy At present, the Italian market is relatively static (national market of 460,000 tonnes in 1987 and 1988, 480,000 tonnes in 1989). In recent years two factors have influenced this situation: an increase in the domestic market of around 10% and a drop in steel exports of around 30%.

The growth of the national market has mainly occurred in the public building and light, steel-based structures sector. Another contributory factor has been the growing use of steel structures in areas which have a high risk of earthquakes. The past few years have seen a continuing decline in investment in industrial buildings. Although there is still a demand for small and medium-sized works, steel now has a formidable rival in the form of prefabricated concrete structures. The production of electricity distribution pylons has also diminished, as a result of pressure from environmental protection lobbies. A number of new investments in the public works sector, such as roads and railway lines, have been proposed. Such projects will lead to the increased use of steel in the construction or reconstruction of bridges along existing and future routes. Ten years ago, Italy's production for ex-

port was almost equal to that for the domestic market. Nowadays, it accounts for less than 20% of total steel production.

This drop is attributed to steel production in recently industrialised countries which, having formerly imported steel, are now self-sufficient and themselves able to export.

Belgium Between 1980 and 1985, production declined steeply. Since 1987, however, it has grown: 171,000 tonnes in 1987, 195,000 tonnes in 1988 and 203,000 tonnes in 1989. However the market share of constructional steel is expected to increase in certain sectors: industrial buildings, department stores and single-storey commercial buildings. The slight decline in the market share of steel structures for office buildings is due, among other things, to the costly impact of fire prevention standards. At present, there are no figures on the market share of steel in multi-storey buildings.

The Netherlands Consumption of constructional steel in the Netherlands is relatively high considering the size of its population, the main reason being the absence of national suppliers; 694,000 tonnes in 1987, 727,000 tonnes in 1988 and 717,000 tonnes in 1989. The principal market is industrial buildings, where steel commands a substantial share of the market.

In the non-industrial construction sector, steel accounts for a large share of the retail trade and agricultural sector, and is frequently used for extensions. The share accounted for by steel structures in the office buildings sector is fairly limited.

In the Netherlands, many constructional steel contractors have prospered thanks to the market provided by North Sea and hydraulic installations. The offshore recession has resulted in a shortage of sites. Manufacturers in the smaller-scale building sector are currently very busy.

The main constraints on steel are the existence of a well-established concrete industry and resistance to change.

Denmark Production is stable, around 50,000 tonnes in 1988 and 1989. Over the past few years, the Danish industry has benefitted from a continuous programme of investment. Before long, there should be an increase in industrial activity, which should in turn influence the building sector. Fire prevention continues to pose a problem for buildings with two or more storeys. Steel-structure, single-storey buildings are not very widespread in Denmark. Investment in agricultural buildings has been cut recently due to uncertainty over subsidies and future government requirements regarding environmental protection. A significant increase in the construction of steel bridges is expected, owing to the various projects undertaken by Danish national railways regarding railway bridges. The long-awaited plans for the "Great Belt Crossing" are expected to generate extra business in the sector.

Technology

Computers have revolutionised steel manufacturers' engineering and design departments in terms of computations, computer-aided design, automatic design, computer-aided manufacture, with numerically controlled machines (cutting, forming, drilling). New, improved conveyors have been developed.

Other technical improvements have been achieved in terms of the raw materials supplied to the construction industry, such as:

- ❖ improvements in the anticorrosion properties of steel (copper bearing steel chrome-copper, chrome-aluminium steel);
- ❖ the production of variable thickness sheets during rolling.

Outlook

As in the past, the growth of the constructional steel industry depends on the development of the various consumer sectors (general industry, construction and public works), competition between steel and concrete structures and the emergence of new sectors such as civil engineering works or sports and socio-cultural buildings.

Over the past few years, many firms have had to make major efforts as regards adaptation, organisation and productivity. They will soon have to contend with intra-EC competition as well as competition from Japanese industry which, with its high level of automation, is highly competitive on export markets.

Written by: Sema Group Management Consultants

The industry is represented at EC level by:
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The window frames sector includes three types of product, differentiated by the raw materials used: metal products, wooden products and uPVC products. As with all sectors linked with the construction sector, the window frames sector has gone through a recession in the early 1980's.

The situation has improved recently, both because of the increase in new building construction and because of the greater importance of the renovation sector as an end market for window products.

The industry is mainly composed of small and medium-sized enterprises, with a tendency towards increased specialisation.

Description of the Sector

The EC metal window frames industry incorporates curtain walling and structural glazing. This industry comprises a number of manufacturers who use and sometimes design mostly aluminium profiles and systems for outdoor construction such as windows and doors.

Three types of products are included:

- ❖ Metal products: windows, doors, curtain walls, structural glazing, cladding, balustrades and hand rails;
- ❖ Wooden products: windows, doors, balustrades and hand rails;
- ❖ uPVC products: windows, doors and certain forms of cladding.

It should be noted that curtain walls and structural glazing are principally composed of aluminium or steel.

Until recently the sector covered NACE 314.2, but last year the EC Statistical Office started revising part of the NACE codes, the revisions included modifications for the sector of metal windows, curtain walls etc.

The sector now falls under NACE 28.12 (Mechanical Engineering) and has the following two headings:

NACE 28.12 Manufacture of builder's carpentry and joinery of metal

- HS 7308.30 Doors, window-frames and thresholds for doors of iron or steel;
- HS 7610.10 Doors, window and their frames and thresholds of aluminium.

The statistics of this monograph are based on relevant data from the construction industry, data furnished by window manufacture associations and surveys.

Table 1
Window frames
Sales by type of material used (1)

(thousands)	1984	(%)	1985	(%)	1986	(%)	1987	(%)	1988	(%)	1989	(%)
Wood Index	21 181	49	20 088	47	19 933	44	19 749	42	20 547	41	21 396	40
	105		100		99		98		102		107	40
Aluminium Index	13 605	31	13 512	31	14 464	32	14 803	32	16 178	32	17 985	34
	101		100		107		110		120		133	34
PVC Index	7 585	17	8 258	19	9 792	22	10 762	23	12 039	24	12 813	24
	92		100		119		130		146		155	24
Other Index	1 171	3	1 096	3	926	2	1 313	3	1 284	3	1 268	2
	107		100		84		120		117		116	2
Total market Index	43 542	100	42 955	100	45 115	100	46 628	100	50 047	100	53 462	100
	101		100		105		109		117		124	100

(1) Excluding Greece, Ireland, Luxembourg and Portugal
Source: FAECF

Current situation

Between 1984 and 1989 the market for windows increased by 22%.

Metal and uPVC-windows increased their market shares respectively by 3% and 7%.

The percentage for the wooden window sector has decreased considerably.

However, in absolute terms this sector is stable at the 1984 level.

The demand for doors, windows, curtain walls, etc. is derived from the construction industry. The evolution of the sector is thus directly related to the evolution in the building sector. However the production of windows tends to outstrip production in the construction industry. Changing architectural and building trends, as well as the emphasis on the renovation market explain the differences between the window sector

and the construction sector.

For the window sector, two different markets can be distinguished: new buildings and renovation.

The new building sector was in recession from the end of the 70's to the mid 80's.

The general increase in the activity of the construction industry in the EC, first witnessed in 1986 has since continued in some countries. However, in some countries the industry fears that this increase is now coming to an end.

The recent demand for buildings has not been the same in all sectors. The largest increases have been in the new non-residential buildings and in the renovation of residential buildings.

Since the 1970's the renovation sector has developed spectacularly. By 1987, 50% of the windows produced went into renovated

buildings. The mainstay of renovation activity is the residential sector.

Industry structure

According to the type of material used, two sorts of manufacturers/constructors can be distinguished.

On the one hand there are a large number of small constructors who usually employ a limited amount of personnel, mostly fewer than 10 people, and often only 5 or 6. On the other hand there are a small number of large constructors or industrial manufacturers. These two markets tend to overlap.

The smaller constructors are often active in the manufacture of doors and windows destined for relatively small buildings.

They provide the basic material (metal profiles uPVC - profiles or basic wooden profiles) which have then to be trans-

Table 2
Window frames
Sales by country, 1989

(thousands)	Wood	(%)	Aluminium	(%)	PVC	(%)	Other	(%)	Total	(%)
EC (1)	21 396	40	17 985	32	12 813	24	1 268	2	53 462	100
Belgique/Belgie	967	59	344	21	311	19	9	1	1 631	100
Danmark	723	69	178	17	126	12	21	2	1 048	100
BR Deutschland	4 986	38	3 149	24	4 723	36	262	2	13 120	100
Espania	1 510	21	5 150	72	486	7	0	0	7 146	100
France	3 085	44	2 103	30	1 823	26	0	0	7 011	100
Italia	3 538	49	2 166	30	1 083	15	434	6	7 221	100
Nederland	2 298	65	708	20	472	13	35	1	3 513	100
United Kingdom	4 289	33	4 187	33	3 807	30	507	4	12 790	100

(1) Excluding Greece, Ireland, Luxembourg and Portugal
Source: FAECF

formed into the final product. Their products are mostly destined for private housing and small commercial and industrial buildings. The main advantage of these constructors is the fact that they build custom-made windows and doors in small numbers. This is possible as they employ relatively traditional methods and complicated calculations are not always required. Industrial manufacturers can be classified into two categories. On the one hand those who try to compete with the smaller constructors by offering standardised doors and windows. They are a minority. On the other hand, those who work on larger and more complicated jobs. These firms are active in the field of curtain walling and structural glazing in addition to the supply of windows and doors. They tend to develop and use their own systems - their target is the larger construction sites which require sophisticated solutions e.g. Messeturm in Frankfurt, Pyramid of the Louvre and l'Arche de la Défense in Paris.

The structure of the industry is represented in the "scheme of supply and installation".

The trend towards vertical integration by the suppliers to the sector has not stopped yet. The extruders of aluminium profiles are developing their own systems and ranges. These tend to compete with the custom-designed and custom-extruded systems and ranges of the specialised constructors. None of the specialised constructors have extruding facilities and that they always have to rely on the suppliers to have their systems produced.

Employment

In 1989 about 130 000 people were employed by some 21 500 firms. However,

Table 3
Window frames
Structure of market by construction type, 1984-89 (1)

(%)	1984	1985	1986	1987	1988	1989
New construction						
Residential	51.5	49.5	48.1	46.3	44.4	44.8
Non-residential	48.5	50.5	51.9	53.7	55.6	55.2
Total	100	100	100	100	100	100
Renovations						
Residential	74.5	74.5	73.9	73.1	73	70.2
Non-residential	25.5	25.5	26.1	26.9	27	29.8
Total	100	100	100	100	100	100
All construction						
New construction	56.4	53.7	51.3	49.9	49.9	49.8
Renovations	43.6	46.3	48.7	50.1	50.1	50.2
Total	100	100	100	100	100	100

(1) Excluding Greece, Ireland, Luxembourg and Portugal
Source: FAECF

this is a slight underestimation as in many countries new small constructors have set up business. Although employment figures are rising, the number of firms is decreasing, one of the reasons being that some mergers are taking place at the European level.

Training and Formation The present problem in the sector is the lack of sufficiently qualified personnel. Due to the slump of the early 1980's few people were attracted by the construction industry. This has resulted in lack of sufficiently qualified workers in metal joinery which creates difficulties in the present market situation. The introduction of new techniques, especially in computerisation, automation and management also presents a number of difficulties at the administrative level. The lack of management capacity within many firms could lead to a series of takeovers in the future. The metal window sector is confronted with the following three structural problems which mutually reinforce each other:

- specific training is not available at either technical level (workforce) or at academic level (engineering & design). New educa-

tional courses are being prepared in many countries, some of which have already gone through an experimental phase, e.g. Belgium, France, The Netherlands;

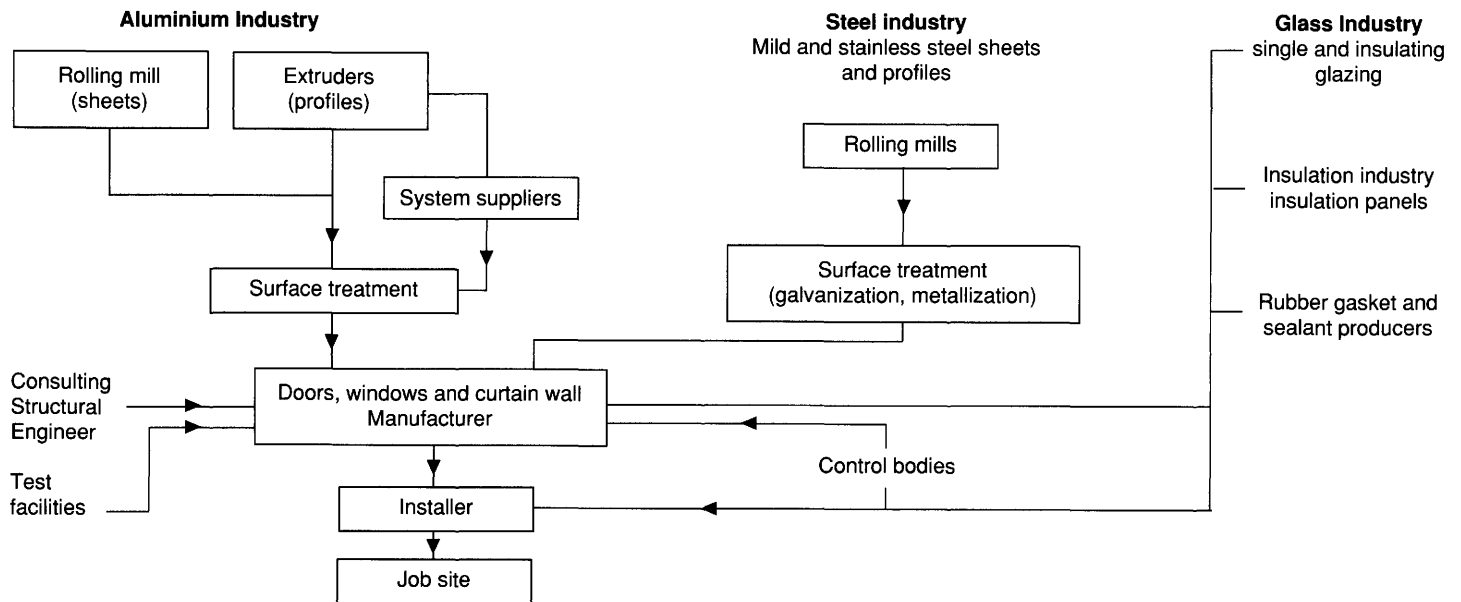
- owing to the long period of time needed for training it is becoming increasingly difficult to motivate people to take on courses.

Moreover, follow-up training is rarely provided by existing schooling. With the approach of 1992, some non-technical skills will gain in importance, making it probably even more difficult to attract the right personnel. These non-technical skills can broadly be divided into languages, law, finance and management techniques.

1992 could offer some ways out if it were possible to adopt a basically uniform approach to training in the sector.

Wages and Costs The sector is confronted with heterogenous approaches to wages and costs in all countries. In some countries the sector is even confronted with different approaches according to region. The status of employed labour also plays a

Figure 1
Window frames
Scheme of supply and installation



Source: FAECF

considerable role in costs. For example in Belgium a draughtsman can be considered either as a blue-collar or white-collar worker. If the draughtsman gets a gross revenue of 100 the cost for the employer is 167 if the draughtsman is considered as blue-collar or 134 if he is considered as white-collar.

Design

For each project the manufacturer must decide which materials and structural systems to use in order to meet the requirements of the architect and the standard regulations. Each building has its own characteristics, which have to be taken into account from various points of view: aesthetics, stability, weathertightness, thermal and acoustic insulation, fire resistance, ageing, etc.

These points are defined in terms of design criteria which must be met by the profile design and the installation procedure. Care must also be taken in selecting adequate infillings.

Most manufacturers buy aluminium profiles from system suppliers or directly from the extruders offering their own systems. These companies can be part of the same group

(vertically integrated companies) or they can be independent suppliers of the highly competitive open market (non-integrated companies). Moreover, large-scale manufacturers usually employ systems developed by themselves and designed for their specific requirements. In such a case the dies used for extrusion of the profiles remain the property of the manufacturers. The systems used for building projects must meet the design criteria and requirements made. Sometimes standard systems can be used, in other cases specific or new systems have to be developed for which the manufacturer must have the know-how required.

Introduction of CAD/CAM methods has made design work much easier in this respect.

In the past 20 years, design of outdoor construction has been improved. This led to higher performance levels as well as better quality. Aluminium profile sections are equipped with thermal breaks for reducing the risk of condensation inside the profiles and achieving better thermal insula-

tion.

New types of glazing with reflective coatings and better thermal and acoustic insulation were introduced on the market. New surface treatment procedures for clear and coloured aluminium sections give the architect a wider range of possibilities to choose from with regard to the aesthetic aspect of the building. New glazing techniques such as structural glazing were developed where silicone replaced glazing beads for fixing the pane to the window or curtain wall frames.

Manufacturing is mainly based on finished or semi-finished profiles and sheets made of aluminium or mild and stainless steel. Compilation of statistics on the European window market requires also other materials, i.e. wood and uPVC to be included. Steel is becoming less and less important as frame material and has thus not been taken into account.

Furthermore, a large number of other materials are used in window, door and curtain wall construction such as glass and insulation panels for infillings, sealants and

rubber gaskets for weatherproofing and hardware for opening and fixing. All these materials are usually subcontracted by the manufacturer, be it in aluminium, uPVC or wood, to specific suppliers.

Geographic variance

According to the climate, different types of products are used and different technological approaches are developed. In the colder northern parts of the EC the use of thermal break profiles is universal. In the southern parts thermal break profiles are only used when needed to satisfy specific requirements.

The competition between European firms for the larger contracts remains intense. Spanish firms have become an important force in the last few years. However the German, French and Italian enterprises are keeping their dominant position.

Investment

Generally speaking this sector is following the investment trends of the metalworking industry. This level of investment is remaining high and in the window sector it is expected to continue.

Investment is heavily centred on the introduction of computer techniques.

Basically the firms first invest in computers to streamline the follow up of orders. The larger and more technically advanced are introducing CAD/CAM into their design offices and investment focuses on the introduction of three-dimensional drawing applications.

Special Issues

The EC directive on building products

On February 11, 1989 the EC published its directive on the approximation of the laws of the member states relating to products destined for the construction industry (89/106/EC).

The backgrounds to this so-called "Construction Products Directive" are:

- ❖ barriers to trade which the treaty of Rome defined (article 30 on mutual recognition and article 36 on harmonization)
- ❖ the first construction products directive abandoned in 1979
- ❖ the "New Approach" council resolution of May, 7th, 1985.

The aim of the directive is to enable free movement, marketing and use in the internal market of all construction products which comply with the essential requirements laid down in the directive. These include mechanical resistance and stability, safety in case of fire, hygiene, safety, protection against noise, energy, economy and heat retention.

The technical specifications are to be drawn up by the European standardization organisation CEN and will not be mandatory.

National authorities will be obliged to recognize that products manufactured in conformity with harmonized standards are presumed to conform with the essential requirements.

The construction products directive (while being concerned with products) makes requirements for buildings. This means that the essential requirements laid down in the directive with which the products are required to comply are formulated in relation to the construction works in which the products are to be incorporated rather than in relation to the products themselves.

The impact of 1992 The essential requirements provide the basis for the preparation of harmonised standards in Europe. The goals of these harmonised standards are fourfold:

- ❖ to achieve the greatest possible advantage

for the single internal market;

- ❖ to give access to the single market to as many manufacturers as possible;
- ❖ to ensure the greatest possible degree of market transparency;
- ❖ to create the conditions for a harmonized system of general rules in the construction industry.

These standards will be prepared by CEN, the European Committee for Standardisation. Once finalised, the standards should then be adopted as national standards in each member country.

For the window sector the following CEN Technical Commissions will be involved: CEN TC 33 Windows and Doors, CEN TC 48 Acoustics, CEN TC 89 Thermal insulation, CEN TC 127 Fire protection, CEN TC 129 Glass.

In the case of products where European standards cannot be realised within a reasonable period of time, these products may be covered by a European Technical Approval.

Where there is no harmonised standard or European Technical Approval, recourse may be made to a National Technical Specification.

Implications for manufacturers The manufacturers should be able to maximise the potential advantages of the single market. This will impose at present and for the near future the following demands:

- ❖ align products to European standards or technical specifications;
- ❖ collaboration with the European organisations which will draw up these standards and specifications; this will encompass a great amount of work as many CEN commissions are involved;
- ❖ adoption of quality control and quality certification procedures; this is deemed to re-

quire an investment in time, personnel and money;

- ❖ review of the firm's strategy, business plans, commercial contacts in view of the single market.

Environmental protection Lately environmental aspects have entered the field of window making. All materials used in windows are submitted to some sort of criticism. The use of exotic woods threatens the forests in Brazil, Canada and other places. uPVC is held to be hazardous and in some local municipalities in Europe its use is even forbidden. Aluminium is considered as being too energy consuming when the raw material bauxite is processed into aluminium. In spite of these problems, it is currently impossible to produce windows in materials which have no adverse environmental impact.

Outlook

The future of the window-frame industry is

closely related to the future of the construction industry: according to the European Construction Industry Federation, there will be a positive 2% variation in the construction activity when compared to 1989. The main activity will probably be in the renovation sector (+ 2,6%). The increase in new buildings would drop to 1,5%.

However, the return of inflationary pressure may cause countries to adopt a restrictive monetary policy - indeed mortgage rates have already increased since 1989. The recent increase in energy prices will probably influence private investment in buildings. Public spending is expected to remain at a low level, both in new building and in renovation.

It is still too early to say how the opening of the east European market will influence the sector. Until now, firms in the window sector in eastern Europe were only in-

involved in the realisation of specific projects such as hotels and airport facilities where they acted as subcontractors to general contractors, mainly of Indian origin. All these countries need to upgrade the quality of their building stock. Consequently in the next few years renovation is expected to become increasingly important for them.

**FAECF: Federation of European Window and Curtain Wall Manufacturer, Associations
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Reviewed by: European Research Associates

In 1989, boilermaking production stood at 17.6 billion ECU. The industry provides 227,000 jobs and regularly yields a surplus in external trade. In terms of volume, business declined by 1% per year between 1980 and 1989. Value added remained stable over the same period. The industry is currently undergoing radical changes given the fact that heavy industries (oil, gas, energy, iron and steel) are suffering from an acute lack of investment, while export markets are becoming more competitive and less solvent. There have been large-scale job losses since 1980 (2.15% per year on average between 1980 and 1989) although the number of people employed remained stable in 1989 compared with 1988. Boilermakers need to seek new outlets in rapid-growth industries and update their technical skills if they are to satisfy demand from new clients and the need to modernise production methods.

Definition of the sector

Boilermaking products can be divided up into the following categories:

- ❖ steam generators and boilers;
- ❖ nuclear boilers;
- ❖ accessory devices for steam generators and boilers;
- ❖ flat and tubular heat exchangers and condensers for nuclear reactors;
- ❖ water tanks and containers;
- ❖ distillation, refining and similar installations;
- ❖ piping and conduits;
- ❖ miscellaneous activities, including fitting and maintenance.

Since classifications differ within the EC, it is difficult to estimate the importance attached to

the boilermaking industry in each of the various countries. The boilermaking sector supplies numerous branches of industry.

In descending order of importance, its main outlets are:

- ❖ thermal and nuclear energy production;
- ❖ the hydrocarbons industry;
- ❖ the chemical, petrochemical and pharmaceutical industry;
- ❖ the food and drink industry;
- ❖ the construction industry;
- ❖ the iron and steel and metallurgical industries
- ❖ the paper industry;
- ❖ various other industries, including carmaking, textiles, engine construction, cement, rubber and electronics.

Table 1
Boilermaking
Main Indicators, 1980-90

(million ECU)	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990 (*)
Apparent consumption (1)(2)	10 171	10 837	11 530	11 774	11 493	12 863	13 450	13 676	15 468	16 412	N/A
Net exports (2)	1 347	1 892	2 201	2 038	1 873	2 103	1 755	1 475	913	1 193	N/A
Production (1)(2)	11 518	12 729	13 731	13 812	13 366	14 966	15 205	15 151	16 381	17 605	18 400
Employment (thousands) (1)	273	265	259	240	229	240	231	226	227	227	230

(1) 1980-1984 : Netherlands not available

(2) 1980 EC 9; 1981-85 EC 10.

(*) Estimated

Source: Eurostat (Inde, Bise, Comext)

Current situation

Production in the boilermaking industry has dropped slightly in terms of volume since 1980 (1% per year), but has increased in terms of value (+ 0.6% per year). In 1989, it stood at 17.6 billion ECU. The EC is a net exporter, 1.2 billion ECU and visible consumption amounts to 16.4 billion ECU. Production in France, West Germany, the United Kingdom and Italy accounts for more than 80% of total EC production. Thanks to the volume of domestic demand, these four countries managed to establish strong positions and a high degree of specialisation which they were then able to exploit on the major export markets. Investment represents 2 to 3% of the value of production.

Consumption and production

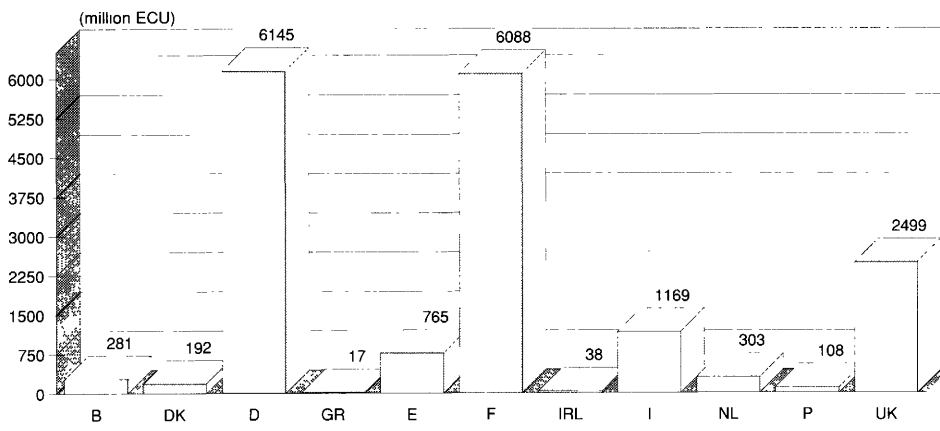
France, Germany, Great Britain and Italy are the four largest producers in the EC (Figure 1).

- In France the main outlets are nuclear energy (which means seeking new markets, taking into account France's overcapacity in electricity and the low level of solvency of world demand), oil, the automobile industry and food and drink. Production remained stable between 1980 and 1989.
- In Germany the main outlets are the chemical industry, carmaking, engine construction and the power industry. The market for anti-pollution installations is rapidly expanding in West Germany. The market is aimed at protecting water and the atmosphere from dangerous pollutants, especially nitrated and sulphurous waste. In spite of the scale of this new demand as well as good results in

terms of exports, West German production remained stable between 1980 and 1989.

- In the United Kingdom, the main outlets are the oil industry (in particular, open sea extraction), energy production, harbour and shipping industries and iron and steel. In the United Kingdom, the volume of production declined sharply by 5% per year between 1980 and 1989.
- In Italy, the main markets are thermal, nuclear and solar energy production, the automobile industry, harbour and shipping activities and ventilation. The gap that exists between small firms which tend to have a flexible workforce and large-scale companies supplying high value-added services is greater in Italy than in the rest of the EC. In terms of volume, Italian production seems to have grown by 3.1% per year between 1980 and 1989. The pattern of production for EC countries is shown in table 2.

Figure 1
Boilermaking
EC Production in 1989 by country



Source: Eurostat

EC production far exceeds that of the United States (more than double) and Japan (nearly 10 times).

- The clientele of the boilermaking sector has changed radically in recent years. A few years ago, the main clients were producers of nuclear or thermal energy and the hydrocarbons industry. Sharp cutbacks in investment in these industries, however, together with the rise of the plastics and electronics industries and the emergence of new outlets in

Table 2
Boilermaking
Production by country, 1980-89

(million ECU)	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989
EC	12 266	13 497	14 556	14 487	13 994	15 563	15 205	15 151	16 381	17 605
Belgique/België	222	192	215	193	242	271	211	235	249	281
Danmark	125	70	98	98	104	119	115	175	183	192
BR Deutschland	3 638	3 805	4 261	4 559	4 327	4 584	4 864	5 158	5 404	6 145
Hellas	26	24	21	20	16	19	19	15	18	17
España	514	532	573	436	396	534	474	549	662	765
France	4 333	4 816	4 819	4 827	4 599	5 460	5 604	5 491	6 269	6 088
Irland	28	31	30	34	37	33	32	36	39	38
Italia	473	510	642	859	1 137	1 249	1 194	1 169	1 419	1 169
Nederland	N/A	N/A	N/A	N/A	N/A	236	261	261	173	303
Portugal	81	96	97	81	59	64	60	91	76	108
United Kingdom	2 698	3 282	3 645	3 222	2 903	2 993	2 371	1 971	2 898	2 499

Source: Eurostat (Inde)

construction and food and drink brought about a shift in the customer balance.

External trade

The EC is a net exporter (1.2 billion ECU in 1989). The EC boilermaking industry has been able to sell its products thanks to major supply contracts with countries in the process of industrialisation. France, in particular, has sold its specialist nuclear power station technology while West Germany has scored a num-

ber of major successes on the export markets (particularly in Africa and the Middle East) by applying a dynamic commercial policy and adapting supply to suit the specific requirements of the client countries. Exports to countries outside the EC stood at 1.2 billion ECU in 1989, while imports were negligible (240 million ECU). The fact that the trade balance with foreign countries is positive (approximately 5% of

production, depending on the year) can be attributed to four countries. West Germany alone accounts for 40 to 50% of this result, Italy - approximately 20%, with France and the United Kingdom accounting for somewhere between 10 and 15%. Trade within the Community amounted to 1.1 billion ECU, i.e. 7% of production.

Structure of the industry

The boilermaking industry is composed of

Table 3
Boilermaking
Production, value added and investment

(million ECU)	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989
Production in current prices										
EC ⁽²⁾	12 138	13 358	14 401	14 329	13 820	15 563	15 205	15 151	16 381	17 605
Index	78	86	93	92	89	100	98	97	105	113
USA ⁽¹⁾	7 000	8 888	8 396	7 950	8 425	8 913	6 253	5 561	5 918	6 968
Index	78	100	94	89	95	100	70	624	664	782
Japan ⁽¹⁾	841	1 584	892	2 689	1 266	1 468	1 428	1 494	1 549	1 875
Index	57	108	61	183	86	100	97	102	106	128
EC										
Production in constant prices	16 764	17 370	16 887	16 164	14 534	15 498	15 450	16 531	16 931	17 706
Index	108	112	109	104	94	100	100	107	109	114
Value added in current prices ⁽²⁾	5 000	5 568	5 915	6 064	6 065	6 426	6 373	6 247	7 006	7 773
Index	78	87	92	94	94	100	99	97	109	121
Productivity ⁽²⁾	26	27	27	29	28	27	28	27	30	31
Index	94	98	98	105	102	100	102	100	109	115
Investment in current prices ⁽¹⁾	335	372	379	350	301	396	365	380	N/A	N/A
Index	85	94	96	88	76	100	92	96	N/A	N/A

⁽¹⁾ Census of Manufactures and Eurostat estimates

⁽²⁾ 1980-1984 : Netherlands non available

⁽³⁾ excluding Portugal

⁽⁴⁾ excluding Greece, Spain, Luxembourg, Netherlands, Portugal.

Source : Eurostat (Inde)

Table 4
Boilermaking
EC trade in current value

(million ECU)	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989
Exports extra-EC (1)	1 542	2 074	2 205	2 178	1 964	2 163	1 887	1 615	957	1 200
Index (2)	71	96	102	101	91	100	86	74	44	55
Imports extra-EC (1)	150	113	169	163	139	158	160	182	183	239
Index (2)	95	72	107	103	85	100	97	110	111	145
X/M	10.28	18.35	13.05	13.36	14.77	13.69	11.79	8.87	5.23	5.02
Trade intra-EC (1)	605	604	542	567	639	724	810	908	982	1 146
Index (2)	84	84	75	78	88	100	105	118	128	149
Share of total (%)	26.7	20.5	24.3	21.3	25.8	27.5	30.7	37.0	53.6	52.6

(1) 1980 EC9; 1981-88 EC10

(2) Taking into account changes in EC membership

Source: Eurostat (Inde, Bise, Comext)

three types of firms

- Firms which install systems constitute the smallest group, but at the same time the most powerful. They are mainly medium-sized firms or divisions of major industrial groups with a diverse range of operations; their activities are three-fold; studies and design, manufacture and on-site installation. Such firms tend to generate considerable value added. Purchases of raw materials account for a mere 20% or so of turnover, whereas personnel costs represent around 45%. System installers are now offering an ever wider range of maintenance services. This is due firstly to greater emphasis on making installations financially viable and secondly, ageing equip-

ment. In areas which require a high level of skill, such as nuclear energy, firms are tending to broaden the scope of their services.

- Specialist producers supply equipment for heavy industry, for the manufacture of tanks, heat exchangers, boilers, etc, which are then incorporated in a single overall process. Some products, such as tanks, are manufactured in batches. Others, such as exchangers, are designed and manufactured according to the client. Specialist producers tend on the whole to be medium-sized firms which operate on a national scale, while co-operating with system installers on the world market.

As regards the rest of the world, there is little

competition in this highly specialised field.

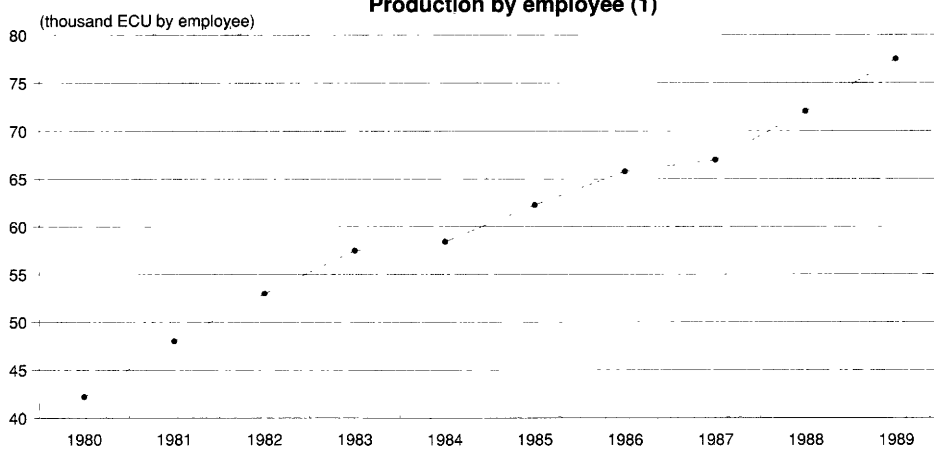
In firms of this type, the value added is less than in the case of system installers; purchases of raw materials account for more than a third of the total turnover.

- Firms which specialise in different areas constitute the most common type; they act as sub-contractors for system installers. They are mainly small firms, capable of manufacturing exceptionally difficult items (from titanium or zirconium, for example) on the basis of plans submitted by the client. Such firms do not generally diversify, have no contact with the end user and 80% of their employees are manual labourers.

Employment, productivity and value added

At the same time as the cyclical variation in production in terms of constant prices, the number of people employed dropped significantly by 2.0% per year over the period 1980 - 89 (see figure 2). The drop has been steady and fairly evenly spread throughout the EC except for West Germany where, within the space of six years, production increased by almost 10% in terms of value, whilst employment levels remained constant. The decline in the number of jobs is partly due to the fact that large-scale investment in domestic mar-

Figure 2
Boilermaking
Production by employee (1)



(1) Production in constant value

Source: Eurostat and ERA calculation

kets has tailed off and the emergence of more dynamic competitors on the export market, particularly from South Korea. Finally, as is the case with all industrial establishments, employment levels in the boilermaking industry have been affected by the development of new techniques (mechanics, robots, computers) and tougher requirements in terms of skill. In the boilermaking industry, system installers tend to focus on studies and design, on drawing up contracts and on-site installation. Much of the intermediary assembly work is contracted out to small local firms, possibly foreign or non-EC, with the result that the administration relating to temporary work is transferred to an earlier stage in the production process. This has been reflected in a decrease in the number of assembly jobs for system installers and an increase for sub-contractors, although overall there is less security of employment. Staff training comes high on the list of priorities of EC boilermaking firms, whether they are small companies or members of large groups. Training extends to related activities, mainly by recruiting engineers and managerial staff from outside the industry. These training requirements stem from the need to improve productivity, in response to growing competition and changing demand, with the new emphasis on high-tech equipment (special materials, complex installations, new processes). Numerous firms have forged links with technical institutes or research centres. Productivity has greatly increased, from 61,000 ECU per employee in 1980 to 65,000 in 1985 and 78,000 in 1989 (constant ECU in 1985). Value added now represents 44% of production and has grown much more rapidly than production.

Outlook

The situation in the boilermaking industry is

unlikely to undergo any major changes, given that the key factors look set to remain stable for a long time to come. The level of activity depends on a number of factors, including investment, technology and competition. The rate of investment in heavy industry in the various EC countries tends to indicate slow economic growth. Were growth to pick up, the first to benefit would probably be the tertiary industries, rather than industrial equipment firms. Cutbacks in investment in the developing countries, competition from countries outside the EC and the solvency of international markets all affect the industry. It is becoming increasingly difficult to obtain profitable export contracts due to the reduced purchasing power of South-East Asian countries and the oil-producing countries, the level of debt of developing countries and worldwide cutbacks in investment in industrial equipment (particularly for energy production). The situation will only improve if there are changes in worldwide growth or if trading conditions alter in such a way as to make contracts more favourable for countries in the process of industrialization. The agreement signed recently between KWU and Framatome regarding export markets illustrates an attempt on the part of European industry (in this particular case, the nuclear boilermaking industry), to strengthen cooperation, in the face of tight, highly competitive markets. Another important factor is the level of productivity and technological development of EC boilermakers. With demand now flat, the industry must be restructured if EC firms wish to remain competitive, both inside and outside the EC. In order to conquer new markets which have specific technical requirements, European

Table 5
Boilermaking
Employment by Country, 1989

	Employees
EC	227 089
Belgique/België	4 078
Danmark	2 672
BR Deutschland	65 177
Hellas	628
España	11 802
France	81 178
Irland	655
Italia	16 624
Nederland	4 156
Portugal	4 496
United Kingdom	35 623

Source: Eurostat (Inde)

firms will have to update their technical skills through continuous initiatives in the field of training. The ability to choose the right form of training depends on the ability of the industry's managers to choose the right strategic guidelines and incorporate new activities which match the needs of the markets, whilst avoiding any overly ambitious attempts at diversification. The markets of the future would seem to lie in electronics, environmental protection, applied chemistry, biotechnological and food engineering. The main activities of the future would seem to be those associated with engineering and design firms, on-site installation and, above all, maintenance, all within the framework of greater structural flexibility. Generally speaking, the boilermaking industry should see an upturn in activity, with an increase in turnover (4.5% in 1990, 2.5% per year in 1991 and 1992) brought about by new activities and stability in the other sectors, largely offsetting the slight downturn in markets connected with electricity.

Table 6
Boilermaking - outlook

(million ECU)	1989	1990	91/90	92/91
Production (constant price 1989)	17 605	18 400	+2.5%	+2.5%

Source: Group Management Consultant

ECBP: European Committee of Boilermaking and
Piping

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Revised by: Sema Group Management
Consultants

The demand for bath water heaters and domestic boilers depends to a large extent on trends in the building sector, and the type of energy available. In six countries of the EC, for which statistical data is available, production figures in current value and added value have increased during the period 1980-1989, reaching 2,700 million ECU and 1,000 million ECU respectively in 1989.

Parallel to this increase there has been a steady decrease in employment in the sector, at the rate of 4% per annum (the latter statistic applies to the same six countries with the addition of France).

The future trend of the sector is basically dependent upon the markets in new buildings and renovation and competition between forms of energy.

The latter could even create a market for replacement in the event of high disparity between the costs of different forms of energy and/or because of the pressures which could be brought to bear by environmental protection regulations.

Description of the sector

Domestic heating appliances (Nace 316.5)

include:

- ❖ room heating appliances;
- ❖ appliances for the production of sanitary hot water;

Products are of the following types:

- ❖ instant or storage water heaters;
- ❖ stoves for heating rooms;
- ❖ boilers for central heating and/or sanitary hot water;
- ❖ other individual heating appliances.

In the area of equipment for homes in the

Community, the following can generally be observed:

- ❖ a considerable increase of appliances using natural gas;
- ❖ the noticeable decrease of appliances using domestic fuel oil or coal, although there are still many of the latter type in the United Kingdom;
- ❖ the large proportion of electric heating appliances in France.

In view of the fact that these products are complex and that they have to comply with very strict safety regulations, rigorous

Table 1
Domestic heating appliances
Main indicators
(in million ECU and in units)

	1980	1985	1988	1989
Production in current value (1)	2 119	2 301	2 524	2 725
Gross added value (1)	809	862	1 032	1 124
Employment (2)	65 448	46 048	44 376	45 372

(1) for 6 countries : B,DK,D,E,I,UK
(2) for 7 countries : B,DK,D,E,F,I,UK
Source : Eurostat

control is essential throughout the whole of the production cycle.

These products are sold by specialists (heating equipment suppliers) to contractors (building) as well as to the public (do-it-yourself).

Production in the EC and employment

The available statistics cover six countries for production and 7 countries for employment. A steady increase of production is

noted in current value: an average of +2.8% per annum between 1980 and 1989, as well as of the gross added value for the sector. In total for 6 countries, the current value of production amounted to 2,725 million ECU in 1989, 40% of which was for appliances using gas. The employment trend is cause for more concern because 44% of jobs have been lost in the sector in 9 years. For the 7 countries of the EC for which statistics are

available, the sector in 1989 represented 45,372 industrial jobs.

Foreign trade

No statistics are available for Extra-EC trade, but it is generally estimated that it is limited.

Intra-EC trade is very active, the main companies in the sector announcing exports in the region of 30 to 50% of their total sales.

Structure of the industry

In addition to low capacity appliances, mainly made of copper or aluminium alloys, many firms manufacture high capacity appliances in cast iron.

For gas appliances, approximately 25 companies in the EC represent 90% of production. The remaining 10% are manufactured by some 85 companies.

The main producer countries of domestic heating appliances are:

❖ the Federal Republic of Germany;

Table 2
Domestic heating appliances
Employment per country

	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989
Belgique/België	5 086	4 316	4 392	N/A	N/A	2 697	2 635	2 576	2 527	2 565
Danmark	1 793	1 551	1 432	1 407	1 636	1 788	1 850	1 850	1 863	1 856
BR Deutschland	12 408	11 566	10 802	8 633	9 119	9 511	9 877	9 952	9 919	10 056
España	7 252	5 896	5 583	5 437	4 451	4 197	4 003	3 892	3 827	4 119
France	9 449	10 817	10 177	9 625	9 310	9 012	8 814	8 616	8 499	8 514
Italia	15 304	11 561	11 306	8 328	10 299	8 496	7 911	8 134	7 925	8 530
United Kingdom	14 156	10 303	10 124	10 911	10 040	10 307	10 205	10 076	9 816	9 732
EC 7	65 448	56 010	53 816	44 341	44 855	46 008	45 295	45 096	44 376	45 372

Source : Eurostat (inde)

Table 3
Domestic heating appliances
Trend of gross added value

(million ECU)	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989
Belgique/België	94	83	93	N/A	N/A	74	82	90	96	105
Danmark	27	27	27	32	35	43	49	47	60	63
BR Deutschland	228	216	224	214	225	264	321	337	316	343
España	115	107	141	92	102	80	72	74	81	93
Italia	205	194	214	174	241	206	228	267	272	304
United Kingdom	140	132	167	183	193	195	186	179	207	216
EC 7	809	759	866	695	796	862	938	994	1 032	1 124

Source : Eurostat (inde)

- ❖ Italy;
- ❖ France;
- ❖ the United Kingdom.

Some important restructurings have occurred in EC countries, leaving, at the beginning of the 90s, only 2 or 3 leading companies on a Community scale in each country. Italy is, however, an exception, with many competitive medium sized firms. Similar restructurings have also taken place between companies from different countries of the EC, for example the takeovers of:

- ❖ Saunier - Duval (F) by Hepworth (UK);
- ❖ Brödge (FRG) and Burnham (NL) by Nordest (F);
- ❖ Chaffotaux and Maury (F) by El-Fi (I).

Research and development

Current R&D is concentrated on methods of improvement and increase of performances in the fields of energy consumption, user-friendliness and ease of installation. A second, different field of research concerns safety and control devices. Certain technological breakthroughs will be associated with the increasing use of electronic components to control the working of appliances and to act as safety devices.

The impact of 1992

Three factors have an important influence:

- ❖ transport costs: these will not decrease very much, because administrative costs at the frontier are relatively negligible in relation to the total cost of transport;

- ❖ non-tariff barriers such as national regulations concerning safety, insulation, installation, quality control, finish, etc. These have not yet been removed, but new regulations, especially in the field of safety devices, should lead to an increase in the prices of appliances;
- ❖ certain trade practices which also act as obstacles to intra-community trade: for example, gas producers in the different countries tend to favour their domestic production by granting discounts on particular types of appliances.

Written by: Sema Group Management Consultants

Since 1985 the production of hand tools has been on the increase in all member countries. The industry has only been partly affected by imports of cheap products from developing countries. EC manufacturers are world leaders in terms of product quality, technical innovation and after-sales service.

Description of the sector

The tools industry comprises four principal segments:

- hand tools;
- tools for joinery tools;
- fixing tools for construction;
- metal saws.

The sector manufactures products including axes, pruning knives, saws, files, rasps, pliers, shears, spanners, tools for drilling, taps and dies, hammers and sledgehammers, planes, chisels, etc.

Production

The EC is the world leader in the production of tools, and the sector can look back on a long engineering tradition.

Nevertheless, Far Eastern nations and the countries of Eastern Europe are active on the market with products that are competitive in price terms.

As regards production, the Federal Republic of Germany is the first manufacturer with an output estimated at more than 700 million ECU in 1989, representing nearly 40% of total EC production. The United Kingdom comes second with a total output in excess of 360 million ECU, closely followed by France whose production is evaluated at 349 million ECU. The total output of the EC grew by more than 3% between 1988 and 1989, and the outlook is encouraging for 1990. The CEO (Eu-

ropean tool committee) predicts an upswing of around 3% for the EC over the next few years across the four groups of tooling referred to above.

The EC countries can be split into three categories depending on the maturity of the market:

The leaders are United Kingdom, France, the Federal Republic of Germany, and Italy who together account for 70% of the market. These five countries which contain 56% of the population and of tooling in the EC have a long tradition of DIY activities and tooling in general. Several distribution channels exist, and all of these are used intensively.

Countries where the tool and DIY markets are developing: Ireland, Spain, Greece and Portugal, together represent 15% of the market and 35% of the population of the EC. Modern distribution networks are just starting to take shape, in particular as a result of the establishment of distribution chains by the leader countries.

Finally, there are the small EC nations with just 9% of the population representing 15% of the market. The distribution channels in these countries are similar to those in West Germany and the United Kingdom.

The four segments of the tools sector each cater for the needs of different markets and have specific channels of distribu-

Table 1
Hand tools
Main indicators, 1980-89 ⁽¹⁾

(million ECU)	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989 ⁽²⁾
Apparent consumption	1 101	1 062	1 073	1 161	1 260	1 305	1 340	1 461	1 627	N/A
Net exports	136	187	209	176	189	257	180	102	51	N/A
Production	1 237	1 249	1 282	1 337	1 449	1 562	1 520	1 563	1 676	1 727

⁽¹⁾ Germany, Spain, France, Italy, United Kingdom.
⁽²⁾ estimates
Source: CEO

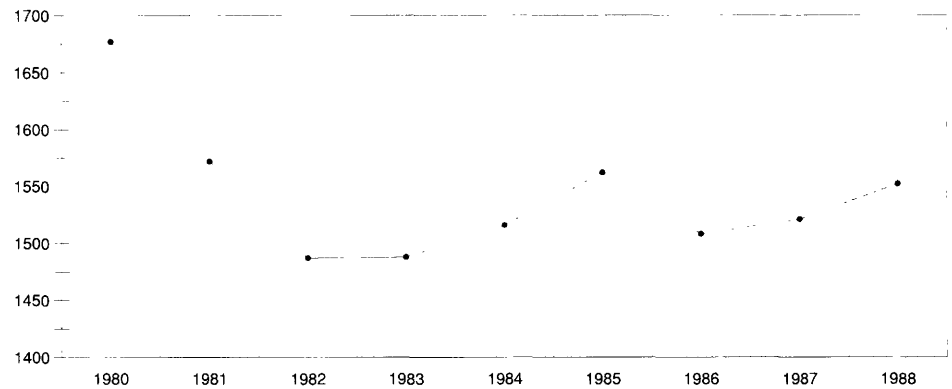
Table 2
Hand tools
Production by country, 1980-89 ⁽¹⁾

(million ECU)	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989 ⁽²⁾
Total	1 244	1 256	1 290	1 344	1 458	1 573	1 526	1 572	1 686	1 727
Belgique/België	7	7	8	7	9	10	8	8	9	9
BR Deutschland	484	453	456	500	558	604	617	638	686	712
España	95	108	95	93	109	115	105	113	128	133
France	291	300	305	297	309	333	319	329	344	349
Italia	97	106	102	105	110	122	129	139	156	153
United Kingdom	270	282	324	342	363	389	348	345	363	380

⁽¹⁾ Germany, Spain, France, Italy, United Kingdom, Belgium.
⁽²⁾ estimates
Source: CEO

tion. Demand for these products is governed by a number of different factors: In the case of saws and tools for joinery machines and metal saws, demand is almost entirely a factor of investments made by client industries (such as furniture makers, sawmills and the mechanical engineering industry in general); In the case of tools for construction (including anchor bolts, masonry drills and power tools) demand is affected by the health of the construction industry which is in turn dependent on the general economic cli-

Figure 1
Hand tools
Production in constant prices, 1980-88



Source: CEO

mate. The principal sales channels for hand tools are the hardware wholesalers, specialist retail outlets and the hypermarkets and supermarkets. Tools for joinery machines and metal saws are partly distributed by retailers and partly sold direct to the manufacturers of plant and machinery. Like the world market in general, the Community's market for hand tools, and especially the electric power tool segment

(see Table 4), is a market undergoing rapid expansion.

External trade

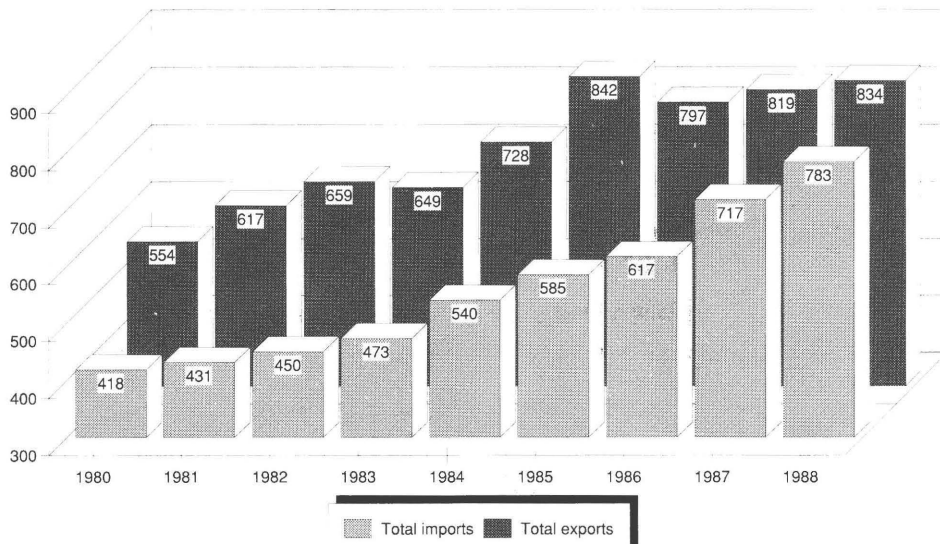
After a modest increase in exports up until 1983-1984 the sector enjoyed a rather more pronounced expansion that was sustained until 1989. The Federal Republic of Germany accounts for 35% of all EC exports, France for 19% and the United Kingdom for 15%. Total exports went up by 44% between 1980 and 1988 and at-

Table 3
Portable electrical hand tools
Consumption by country, 1988

EC countries	%
Belgique/België	4
BR Deutschland	37
España	4
France	18
Italia	10
Nederland	6
United Kingdom	16
Others	5

Source: Bosch

Figure 2
Hand tools
EC external trade in current prices 1980-88 (1)



(1) Germany, Spain, France, Italy, United Kingdom
Source: CEO

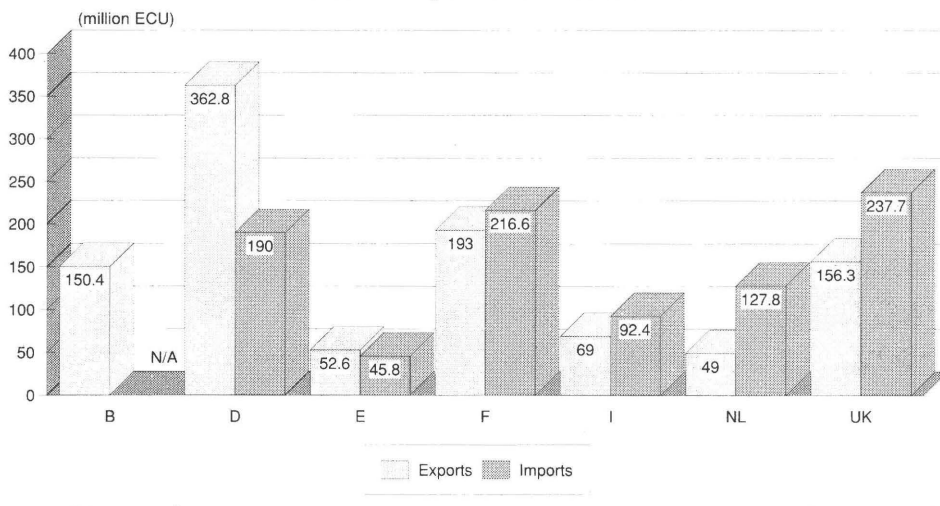
tained 1.2 billion in 1989 or 60% of total production. This figure includes both intra-Community exports and exports to third countries.

During the period 1980-1988 the growth in imports paralleled the increase in exports and attained more than 900 million ECUs in 1988. Among the EC nations, the United Kingdom is the biggest importer with a total of 238 million ECU, followed by France with imports of 217 million ECU. Since joining the Community in

1986, Spain has seen the fastest growth rate in the importation of tools.

The hand tools industry of the EC is moderate in size compared with other industrial sectors: 65% of manufacturing companies employ 20 people or less, while at the other end of the scale the number of firms with more than 500 employees represents under 1% of the sector. The Federal Republic of Germany has the largest number of firms - 750. In some member countries, in the Federal Republic of

Figure 3
Hands tools
External trade by the main countries in 1988



Source: CEO

Germany and Spain for example, the manufacture of hand tools is concentrated geographically.

The Community's hand tool companies tend to be family businesses (a limiting factor in the acquisition of capital) and highly specialised.

Legislative environment

Varying environmental regulations among individual members of the Community have brought about distortions in competition within the EC. Countries which have relatively stringent environmental legislations are compelled to allocate a significant proportion of their budgets to pollution control. This new factor is a source of some uncertainty to a number of manufacturers and is pushing a large number of firms into buying semi-finished products such as rough forgings from alternative sources. The ongoing technical harmonisation within the Community is subject to numerous uncertainties, and manufacturers are experiencing some difficulty in deciding whether production processes have to be modified to come into line with current national or Community standards which are as yet unspecified.

The keen competition of prices caused by the increasing volumes of cheaper imports should force many manufacturers to improve their productivity or to restructure their business operations. These factors are particularly important in those countries where incomes are relatively high, such as the Federal Republic of Germany.

Employment

In virtually every member country the cost of labour grew significantly from 1980 to 1989. It was during this period that incomes greatly increased in the United Kingdom and Italy in particular.

Table 4
Hand tools
Wages and salaries

(1985 = 100)	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989
Belgique/België	70	75	80	87	94	100	104	109	111	108
BR Deutschland	83	87	89	94	98	100	106	107	110	113
España	62	72	79	86	93	100	107	112	114	122
France	60	69	77	89	95	100	104	107	111	116
Italia	50	66	81	86	91	100	109	118	125	136
Nederland	84	89	92	94	94	100	100	108	107	N/A
United Kingdom	63	71	79	85	92	100	108	117	126	137

Source: CEO

Outlook

Production should grow at an annual rate of 2.5% to 3% between 1989 and 1994 provided current market conditions are sustained. The prospects in the construction sector of the European Community should have a favourable effect on the economic position of the hand tools industry.

However it is essential for the industry in the EC to implement structural changes in order to be able to maintain its position into the future. Additional rationalisation is expected to take place, and these operations could take the form of takeovers, mergers, shareholdings or other types of alliance. Such changes will primarily affect the smaller companies.

Table 5
Hand tools
Size and structure of selected tool industries, 1988

Employees	D	E	F	I	Total
1-19	528	15	59	78	680
20-49	107	7	48	34	196
50-99	57	5	14	11	87
100-199	33	1	7	5	46
200-499	18	4	3	2	27
500+	6	1	2	0	9
Total	749	33	133	130	1 045

Source: CEO

Table 6
Hand tools
Production forecasts, 1989-92

(million ECU) constant price 1989	1989	1990	1991/90	1992/91
Total	1 727	1 780	+2.5	+2.5

(*) Germany, Spain, France, Italy, United Kingdom.
Source: CEO, Sema Group Management Consultants

Written by: Sema Group Management
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The industry is represented at EC level by:
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The light metal packaging industry has witnessed steady growth over the past few years. In the medium term, the experts predict an average increase in production of approximately 2 to 3% per year.

Substantial savings in terms of costs as well as major improvements in productivity have been achieved thanks mainly to technological advances. The industry is highly competitive at present given the wide range of alternatives that exists in the packaging sector and the fact that new types of packaging materials are currently being developed. The effect of new regulations concerning the environment and recycling constitutes a particularly important factor for this sector.

Definition of the industry

The term "light metal packaging" refers to all metal packaging which is less than 0.49 mm thick with a capacity of less than approximately 40 litres. "Heavy metal packaging", on the other hand, refers to packaging made from cold-rolled sheet steel with a surface thickness equal to or greater than 0.5 mm and which is used mainly for casks, cans and barrels with a capacity of between 30 and 220 litres.

There is nothing arbitrary about this distinction. It is based on quite different methods of using raw materials and manufacturing technologies as well as completely separate consumer markets.

Within the sector itself, is made a further distinction between the following groups of products:

- ❖ packaging for foodstuffs, in particular, cans for foodstuffs and drinks cans;
- ❖ various types of light, multi-purpose packaging, in particular, paint and varnish cans

with removable lids, oil cans, cans for cleaning agents, non-sealed cans for foodstuffs, decorative cans, aluminium dishes, metal containers for certain specific industrial uses, such as cases for electric batteries;

- ❖ aerosol cans designed to contain a mixture of gas and liquid and used primarily for cosmetics, pharmaceutical products and cleaning agents;
- ❖ lids and caps, including crown caps and other types of metal lids (especially for glass bottles) such as screw-on caps and lids.

The light metal packaging industry is currently worth approximately 6.7 billion ECU, employs over 54,000 people in 300 firms and consumes over 3.5 million tonnes of tinplate and 280,000 tonnes of aluminium per year. Net exports amounted to 220 million ECU in 1989 and visible consumption was 6.5 billion ECU.

It is estimated that light metal packaging

Table 1
Light metal packaging
Main indicators, 1980-89

(million ECU)	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989
Apparent consumption	4 253	4 646	5 073	5 379	5 821	5 912	5 675	5 717	6 121	6447
Net export ⁽¹⁾	129	186	194	206	227	231	199	183	199	219
Production ⁽²⁾	4 382	4 832	5 267	5 585	6 048	6 143	5 874	5 900	6 320	6 666
Employment (thousands) ⁽³⁾	84	81	76	74	70	68	63	60	57	(4)54

(1) 1980 EC9; 1981-83 EC10

(2) Ireland not available; 1980-83 Spain estimated; 1980-84 Greece estimated; 1989 Portugal estimated.

(3) Excluding Ireland; Greece and Portugal estimated; 1980-83 Spain estimated; 1989 Portugal estimated.

(4) Portugal non available.

Source: SEFEL, Eurostat (Comext)

accounts for 16% of Europe's entire packaging sector, which puts it in third place in terms of materials used for packaging purposes. By comparison, paper and cardboard packaging account for 30% of this market, plastic packaging - 30%, glass, 7%, heavy metal, 4%, and wood 4%.

Consumption and production

Originally intended purely for food products, metal packaging has come to play an increasingly important role in everyday life, thanks to its unique properties com-

pared with other forms of packaging. Food packed in metal packaging can be kept for long periods without any loss of nutritional value or any risk of corrosion or poisoning. The object of this longevity is to facilitate the transportation and storage of the products.

In recent years, the economic expansion of the sector has been characterised by a relatively low growth rate of around 2 to 3% per year on average. This growth is mainly due to developments in the canned food industry and the acquisition of new

segments of the market thanks to drinks cans. The situation is far less positive in the case of industrial packaging owing to the difficulties affecting certain consumer sectors (including the construction industry) and stiffer competition from the plastic packaging sector in the case of certain applications (engine oil, cleaning agents). The sector's development is greatly influenced by a series of external factors: changes in individual consumption habits (trend towards individual portions, more sophisticated preservation methods) leading

Table 2
Light metal packaging
Production and external trade, 1980-89

(million ECU)	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989
Production in current prices										
EC ⁽¹⁾	4 382	4 832	5 267	5 585	6 048	6 143	5 874	5 900	6 320	6 666
Index	71	79	86	91	98	100	96	96	103	109
USA ⁽²⁾	N/A	N/A	N/A	N/A	N/A	15259	11253	9930	9 449	N/A
Index	N/A	N/A	N/A	N/A	N/A	100	74	65	62	N/A
Production in constant prices										
EC ⁽¹⁾	5 827	6 064	6 064	6 161	6 292	6 143	6 026	6 100	6 030	6 031
Index	95	99	99	100	102	100	98	99	98	98
EC trade in current prices										
Exports extra-EC ⁽³⁾	133	192	227	260	286	298	261	250	311	366
Index ⁽³⁾	52	70	83	95	96	100	88	84	104	123
Imports extra-EC ⁽³⁾	31	27	37	38	48	51	46	54	90	104
Index ⁽³⁾	62	55	73	76	94	100	90	106	176	204
X/M	4.3	7.1	6.1	6.8	6.0	5.8	5.7	4.6	3.5	3.5
Imports intra-EC ⁽³⁾	276	313	382	408	471	508	524	550	738	827
Index ⁽³⁾	57	62	76	81	93	100	103	108	145	163

(1) Excluding Ireland. 1980-83 Spain estimated; 1980-84 Greece estimated; 1989 Portugal estimated.

(2) 1980 EC9; 1981-83 EC10

(3) Taking into account changes in EC membership

(4) Census of manufactures and Eurostat estimates

Source: SEFEL, Eurostat (Comext)

Table 3
Light metal packaging
Production by country, 1980-89

(million ECU)	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989
EC (*)	4 382	4 832	5 267	5 585	6 048	6 143	5 874	5 900	6 320	6 666
Belgique/België	194	228	272	301	322	343	344	349	312	320
Danmark	156	168	176	196	224	236	235	232	185	197
BR Deutschland	749	853	965	1 006	1 105	1 102	1 178	1 164	1 196	1 260
Hellas	N/A	N/A	N/A	N/A	N/A	180	166	165	183	179
España	N/A	N/A	N/A	N/A	399	398	430	459	473	566
France	802	873	922	931	979	1 036	987	957	977	1 018
Italia	464	420	481	596	694	648	598	655	866	986
Nederland	384	413	475	490	492	494	405	408	408	396
Portugal	90	100	90	92	98	113	103	103	104	N/A
United Kingdom	1 127	1 316	1 386	1 441	1 559	1 594	1 429	1 408	1 616	1 639

(*) Excluding Ireland; 1980-83 Spain estimated; 1980-84 Greece estimated; 1989 Portugal estimated.
Source: SEFEL.

to an increase in demand, for packaging for pre-cooked dishes or aerosols for example, increased competition from new types of packaging (compound plastics based on impregnated cardboard, ultra-light glass, flexible packaging for 4th and 5th range products) or new preservation techniques (deep-freezing, freeze-drying), a psychological aversion to certain types of packaging and presentation, particularly where long-life foodstuffs are concerned. Light metal packaging production can be broken down as follows:

- ❖ 60% food packaging, 50% of which is made up of cans for foodstuffs and 10% drinks cans;
- ❖ 30% multi-purpose packaging;
- ❖ 10% metal seals and accessories.

Tinplate, blackplate and aluminium are the three main raw materials used in the manufacture of light metal packaging.

- ❖ Tinplate is a sheet of cold-rolled steel less than 0.5 mm thick and covered on both sides with a thin film of tin in the order of 3g/ m². It is mainly used in the light metal packaging industry. Some 95% of annual production of tinplate (approximately 11 million tonnes in total) is used by this sector. Among the various

characteristics which explain its intensive use in packaging are a high degree of mechanical strength, ease of decoration (it lends itself to printing just as easily as paper), and the fact that an enormous range of products can be packaged using this method, particularly food, chemical and pharmaceutical products.

Substitute blackplate is made up of a steel base covered with a chrome oxide compound. Although its technical characteristics are less impressive than those of tinplate, it has been extensively used in recent years to produce less demanding products such as bases and lids for cans, caps, etc. The main reason for this increase in popularity is the fact that it costs less than tinplate, the difference being currently estimated at around 10%.

Aluminium is the third most popular material. Approximately 10% of world production of aluminium is used in the packaging sector. Aluminium is primarily used for products such as dishes, containers, flexible tubes, lids and drinks cans, particularly in English-speaking countries. Aluminium accounts for 95% of the drinks can market in the United States (whereas tinplate accounts for a mere 5%), approximately 40%

in the United Kingdom and 12% in Germany.

Changes in the relative price of tinplate and aluminium largely determine the importance ascribed to these 2 metals in the metal packaging sector. The current preference is for tinplate, owing to the relative stability of the price of tin in recent years.

By contrast, the price of aluminium has soared by as much as 50%. In the long term, however, this trend could change. Metal packaging production involves all the EC countries, in varying degrees. The three largest producer countries, the United Kingdom, West Germany and France account for almost 60% of EC output.

Finally, EC output is equal to two-thirds of that of the USA.

External trade

Metal packaging is an activity which traditionally gives rise to little in the way of long-distance international trade. The EC is a net exporter with 360 million ECU worth of exports in 1989 and 104 million ECU worth of imports. Imports are growing at a faster rate than exports, and the Exports/Imports ratio went from 7.1 in 1981 to 3.5 in 1985. Trade within the EC

Table 4
Light metal packaging
The world leaders in 1990

Companies	Turnover in Packaging (')	Specialty
Pechiney (F)	5.0	Metal, plastics, glass
Toyo Seikan (J)	4.5	Metal, plastics
CMB Packaging (F/GB)	3.8	Metal, plastics
Crown Cork & Seal (USA)	3.6	Metal
Tetra Pack (S)	3.4	Paper
Owens Brockway (USA)	3.0	Glass
Stone Container (USA)	3.0	Metal
Jefferson Smurfit (IRL)	1.9	Paper
Continental Can (USA)	1.5	Metal
Saint-Gobain (F)	1.4	Glass

(') Billion US\$; 1990
Source: Pechiney ANC

Table 5
Light metal packaging
Main groups's subsidiaries

Main groups	Principale EC businesses or subsidiaries
Pechiney/American National Can (F)	American/National Can (UK) Nacanco Deutschland (D) National Can Iberica (E) Cebal (F) Cebal Benelux (B) Cebal Italia (I)
CMB Packaging (F/UK)	Carnaud (F) Metal Box (UK) Carnaud Eurocan (B) Schuybroek (B) Colep (P) Envases Carnaud (E) Eurocan GmbH (D) Zuchner (D) Faba (I) Spray Box (I) Superbox (I) Numan (NL) Hellas Can (GR)
Continental Can (USA)	Continental Can Cy UK (UK) De Clerk (B) Schmalbach-Lubeca (D) Continental Can France (F) Sobeni (B) Thomassen & Drijver (NL)
Crown Cork CY (USA)	Crown Cork Belgium (B) Crown Cork Cy Ltd (UK) Crown Cork Italy (I) Crown Cork Nederland (NL) Crown Cork Scandinavia (DK) Crown Bender (D) Emballages Couronne (F) Productos Corticeiros Port (P)
PLM (S)	PLM - Ball (D) PLM - Haustrup (DK) Gerro Reynolds (D)

Source: Sema Group Management Consultants

is clearly on the increase, amounting to over 800 million ECU in 1989.

Employment and productivity

The combination of restructuring and measures aimed at boosting productivity has resulted in a steady decline in the number of jobs since 1980, from 84,000 to approximately 54,000 in 1989. Productivity increased over the same period, from 70,000 ECU (1985 value) per employee in 1980 to over 110,000 in 1989.

Structural changes

The light metal packaging sector is relatively concentrated in the EC. Its structure is based on two types of companies: large groups which manufacture mainly standardised products and more specialised, small and medium-sized companies (made-to-measure products).

Standardised products, involving mass production using highly automated equipment, are manufactured by a limited number of fairly large companies in each country, such as drinks cans, food cans of a standard shape and size, caps, etc. The reason for this concentration lies in the scale of investment required (a modern production line for drinks cans can mean an initial outlay of up to 25 million ECU, and such sums can only be financed by powerful industrial groups), access to advanced technologies, the concentration of large consumer firms, such as canning factories and breweries, and the advantages of mass production in terms of unit prices. These factors also explain the new investments, joint ventures and cooperation agreements which have sprung up in this sector. The American aluminium giant Alcoa for example, and the fifth-largest iron and steel group Nippon Kobe Steel

concluded an agreement with a view to setting up a joint subsidiary to produce aluminium cans in Japan, aimed at the Asian drinks market (180,000 tonnes of aluminium/year). Table 4 lists the world leaders in the sector. Table 5 indicates the names of the EC-based subsidiaries of the main groups operating in the light metal packaging sector.

Manufacturers in the packaging sector, particularly packaging for foodstuffs, rarely confine themselves to a single technology.

The three world leaders, for example, deal in a number of materials.

Made-to-measure products are manufactured in smaller quantities for more limited markets. Very often they take a particular shape (conical or irregularly shaped cans), are of an unusual size (cans with very large or small capacity) or are decorated in an original manner. They are produced by small or medium-sized firms employing between 20 and 200 people. General lines cans, where the sheer variety of the products and limited volume ensures maximum flexibility, are mainly manufactured by firms of this type.

The geographical distribution of companies is largely determined by the nature of the products.

Metal packaging combines the advantages of a relatively low unit value (the sale price of an ordinary can is currently around 0.1 ECU) and large volume. Transporting metal packaging is very much like transporting air, which greatly limits the scope for exports or long-distance deliveries. In the case of an ordinary container, the maximum sales radius within which a firm can deliver its products on competitive terms, taking into account transport costs, is approximately 300

Table 6
Light metal packaging
Structure of the Industry, 1989

	Manufacturers	Employment	Production in tonnes	Productivity kg per employee
Belgique/België	9	2 310	204	88
Danmark	13	1 900	102	53
BR Deutschland	52	10 699	641	60
Hellas	15	1 870	73	39
España	71	6 100	401	66
France	35	8 181	559	68
Italia	64	5 400	550	102
Nederland	9	3 487	190	54
Portugal	N/A	N/A	N/A	N/A
United Kingdom	34	13 240	687	52

Source: SEFEL

kilometers. That explains why, in geographical terms, manufacturers are so widely dispersed in almost every region of the European Community and why the majority of food can manufacturers are situated in predominantly farming regions; the tendency of national or even regional groups of manufacturers to buy up the products enables them to reach a wider market.

Table 6 shows the distribution of European metal packaging manufacturers, by country.

Environmental problems

In terms of volume, packaging accounts for almost one third of the 100 million tonnes of waste generated by households in the EC. In terms of weight, metal packaging represents less than 2% of this waste and drinks cans - less than 0.5%. National and EC policies regarding waste aim to:

- ❖ increase the proportion of recyclable packaging by discouraging the sale of large quantities of non-returnable packaging;
- ❖ encourage new forms of environmentally friendly recycling.

This attitude has led to the introduction of a whole series of new regulations, including most notably the European directive on the packaging of food liquids which envisages a 70% recycling rate for packa-

ging. A number of national laws specifying quotas for returnable or non-returnable packaging, or simply banning certain types of packaging have also been promulgated. Denmark, for example, has banned the sale of beer and other cold drinks in metal cans or non-returnable bottles; Germany, for its part, has introduced a 0.50 DM deposit on plastic bottles and decided that 90% of still water and beer will be sold in recyclable packaging from June 1991.

With this end in view, 22 international companies which either produce or use consumer product packaging have decided to join forces within the framework of an association known as ERRA (European Recovery and Recycling Association) in order to find ecological, cost-effective solutions to the problem of treating waste.

Outlook

The diverging pattern of demand in various user sectors together with increased competition from plastic packaging for a large number of applications lead, to a relative slowdown in production:

- output in 1990 - slightly over 6.7 billion ECU (1989 value), i.e. 1% up on 1989;
- a growth rate of approximately 1% for 1991 and 1992. Some market segments, however, will perform better than others:

- it seems likely that the food can industry will enjoy a period of growth and traditional food cans will probably not be replaced by another type of packaging for a few decades to come;
- the animal feed sector is currently growing at a rate of 6 to 10% per year with good prospects for the future;
- the market for drinks cans will grow by nearly 20% between now and 1995 while metal cans should retain and even increase their current market share by 12%. Some EC manufacturers however, have overreacted to this potential demand and have gone ahead with large-scale investment which could lead to surplus production capacity in certain regions;
- Packaging for miscellaneous applications,

such as paint and detergents, will maintain its present position, at best.

Alongside these changes on the market, the next few years will see fairly spectacular advances in terms of the quality of the products, on the one hand, and the productivity of production lines, on the other.

These forecasts are based on various factors; the development of new materials, the growing tendency to reduce the thickness and quantity of tin used thanks to better quality protective coatings, the introduction of new systems for opening cans and vacuum packing, the use of laser welding techniques, the rationalization of production through a higher degree of standardization, more sophisticated printing techniques, enabling packaging to play a

more important role as an advertising medium, steady increases in productivity. Finally, the trend towards concentration within the EC which we have observed over the past few years on both a European and worldwide scale, looks set to continue in the years ahead.

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