Paper for the European Business History Conference in Barcelona, September 2004

The European petrochemical industry in the late 20th century: is it a declining industry?

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Introduction

A critical examination of the claim that mature economies move away from industry to services should include a discussion on the manufacturing industry as well as the services. What happened to the manufacturing companies, which were supposedly superseded by the service companies? This paper highlights developments in the European petrochemical industry between 1970 and 2000, with a special focus on the Shell petrochemical companies. Shell belonged to the major players in the chemical industry. Measured in sales proceeds, its chemical activities were the largest of the oil majors. They ranked among the twenty largest chemical companies worldwide.

During the 1950s and 1960s, the chemical industry had experienced a period of rapid growth. From 1970 onwards, growth halted and chemical firms were confronted with over-capacity, in particular in Europe. This paper will explore the survival strategies of Shell chemical companies. One option was diversification into more specialised chemical products, which however required a different technology, organisation and culture than the production of commodities. Another strategy entailed the reduction in capacity, notably in ethylene production in Europe. The third strategy was moving out of Europe and the US and into the Middle East and Asia. I will discuss these three strategies and their results for Shell Chemicals as well as the European petrochemical industry.

From growth to stagnation and overcapacity

In the early 1970s people in the chemical industry started to look in nostalgia upon the spectacular growth of the petrochemical industry during the 1950s and 1960s, when it had been one of the leading sectors in the world economy. The products of the chemical industry invaded daily life to such an extent that some observers characterized the second half of the 20th century as the Chemical Age.[1] People started to wear wrinkle proof clothes made of nylon and polyester or a mix of those with natural fibres. Washing was made easy by synthetic laundry powders. Kitchen tables were covered with synthetic laminate such as formica. Wooden furniture could be thoroughly protected with polyurethane varnish. A wide range of new medicines and cosmetics became available. The building industry profited from the flexibility and durability of plastics in the form of electrical fittings, water pipes and insulation. The car industry used synthetic rubber for car tyres. Packaging based on paper was replaced by plastics as e.g. transparent film. To a large extent, though not entirely, the new synthetic products replaced traditional natural materials such as wood, cotton, silk, wool, rubber and leather. They also created entirely new products and uses.

The enormous growth of the petrochemical industry was based on technological innovations and on the availability of cheap feedstock. The petrochemical industry in the US used natural gas, while in Europe naphtha, one of the 'middle distillate' products of an oil refinery, was the main feedstock. In ascending order of boiling point, the main fractions into which crude oil can be separated are petroleum gases, gasoline, naphtha, kerosene, gasoil (or diesel), lubricating oil and waxes, fuel oil and bitumen. In the 1950s and 1960s naphtha was available in Europe at relatively low prices, because crude oil prices were low and naphtha was produced alongside gasoline and fuel oil.

Shell belonged to the major players in the petrochemical industry. Measured in sales proceeds, its chemical activities were the largest of the oil majors, and ranked among the twenty largest chemical companies worldwide.[2] In 1970 Shell chemical activities were concentrated in five countries: The Netherlands, UK, France, Germany and the US. They mostly produced base chemicals, industrial chemicals and

[1] H.D. Crone, *Chemicals & society: a guide to the new chemical age* (Cambridge: Cambridge University Press, 1986), 3-10.
[2] *Shell Chemicals Information Handbooks*,1981/82-1998/99. Figures based on *Chemical Insight*.

polymers, which served as building blocks for the manufacturers of final products, and further agrochemicals. During the 1960s plants grew bigger and bigger, because large-scale production diminished cost per unit. In the 1950s, for instance, naphtha crackers had capacities of around 50,000 tons of ethylene per year, while in the early 1970s new crackers had a capacity of between 300,000 and 500,000 tons of ethylene.[3] Petrochemical plants posed high demands on capital, but the expectation was that these expenditures would be justified when higher volumes would be met by increasing demands in the future. Moreover, the economy of scale contributed to a significant reduction in manufacturing costs. Profitability seemed just around the corner as soon as the growing supply would be matched by growing demand.

However, in the early 1970s, even before the first oil shock, growth in demand for petrochemicals slowed down just as more new production capacity was being installed. In 1972 Shell's chemical sector undertook a comprehensive review to analyse the strengths and weaknesses of its various activities with the intention of concentrating efforts on those areas where the Group's position and prospects were fundamentally strong, while withdrawing from those areas where the opposite was the case. With the help of an external advisor, the sector developed a planning technique, the 'Directional Policy Matrix' or DPM, to assess the portfolio of activities. All activities were plotted in a matrix on the basis of prospects for profitability and the sector's competitive capabilities. The mood was basically optimistic, so most activities were still considered full of promise, in particular activities with advanced technology. Some investment plans were delayed and the direct involvement with fertilizers, the first diversification of Shell in 1928, was ended.[4] Shell even published its DPM planning technique and those who might wonder why methods developed for internal use in order to obtain competitive advantage were made available to all, could read the following motivation:

> 'It would be to the advantage of the industry generally if application of this technique can help other companies to recognize where there strengths and weaknesses lie. There has been in the past a tendency towards imitative and duplicative investment by some companies in certain fields where they have no special position of advantage and this type of investment can be a source

[3] 'Petroleum-based chemicals - the feedstock problem', *Shell Briefing Service* (1973), 4.
[4] *Royal Dutch Petroleum Company (RD) Annual Reports* 1972 and 1973: The fertilizer company Shellstar in the UK was sold to the UKF (Unie van Kunstmest Fabrieken) and the Shell interest in UKF was increased from 16% to 25%.

of excess production capacity. If this tendency can be counteracted in future, it will not only avoid waste of scarce resources, but will also help the industry to earn the rate of return which it needs, in order to undertake future expansion to meet growing demand.'[5]

The message seemed to be that if all chemical companies would concentrate on the areas where they had a competitive advantage, they would no longer spoil each other's market by creating over-capacity.

As an oil major, Shell sought its competitive advantage in the 'oil-petrochemical interface': petrochemical plants integrated into large oil refineries had a wide range of feedstock available, which enabled them in principle to make the most of seasonal changes in feedstock availability and market requirement. To play this game to the most advantage of both oil refineries and petrochemical companies was certainly not simple, but it held the promise of substantial profits.[6] Inspired by the upheaval in the oil industry, Shell paid particular attention to building plants with maximum feedstock flexibility. For instance, the newly installed cracker of Shell Nederland Chemie at Moerdijk could operate on either naphtha or gas oil, or a combination of both.

The years 1973 and 1974 showed a strong growth in demand and profitability, and the problems besetting the industry didn't seem too serious any longer. The fantastic results of 1974, however, turned out to be exceptional, because these resulted from industrial customers stocking up, and concerns about over-capacity returned. The long lead-times involved in setting up new plants exacerbated the industry's susceptibility to economic cycles. One way of tackling over-capacity was trying to take joint measures in Europe industry-wide, but this option was difficult because of the risk of being accused of collusion, and because the interests and views of the various chemical companies were not the same. Some companies were more convinced than others that the reduction of capacity was necessary, or were more prepared to take drastic steps. For instance, national oil companies gave high priority to the safeguarding of employment, and therefore were reluctant to reduce capacity.

The sudden rise in oil prices and demand for chemicals in late 1978 and early 1979 gave the petrochemical industry some respite. The year 1979 was the best one

[5] 'Planning a chemical company's prospects', *Shell Briefing Service (SBS)* (1975)
[6] 'Shell in base chemicals', *Shell Briefing Service (SBS)* (1977)

for the Shell Group since 1974. Profits were high and a number of large and technically complicated projects reached their completion. As in 1974, the high demand in 1979 had partly been caused by stockpiling to forestall further price rises, and therefore Shell management realised that the problem of overcapacity was still very much alive. Indeed, 1980 saw a rapid decline in sales, worsened by the general economic depression. As customers such as the textile, car, packaging and building industry ran into difficulties, demand for chemicals went down. The seriousness of problems of the early 1980s, can be judged from the capacity utilization of ethylene (the base chemical used as feedstock for many other chemical derivates). From 80 per cent in 1979 the ethylene capacity utility of Shell companies fell to 55 per cent in 1982.[7]

Strategies for the 1980s

In 1979, even before the depression of the early 1980s had set in, Anthony Lowe, head of Economics and planning of Shell International Chemical Company, reflected on the business strategies of the chemical industry for the 1980s. He was not overly optimistic. With some scepticism he mentioned that individual chemical companies all seemed to follow a strategy of moving towards 'performance' chemicals:

> 'With, it must be admitted, considerable disillusionment in the board rooms of chemical companies about the results from and the prospects for heavy organic chemicals and plastics – the bulk commodity end of the industry - virtually every president of every chemical company has assured his shareholders in his annual report that, as a business strategy, greater emphasis will be put on high-margin, high-technology, high-growth specialities, intermediates and other performance chemicals.'[8]

Two years later, in 1981, Lowe's picture of the future prospects of the European chemical industry had become even more pessimistic:

> 'Against this background of low economic growth, low growth of demand of petrochemicals and plastics, and sizeable manufacturing over-capacity for some years ahead it is impossible to avoid the conclusion that the prospects

[7] *RD/S financial and operational information*, 1979-1982.
[8] Anthony Lowe, 'Business strategies for the eighties', (paper presented at the SCI London section, 5 November 1979).

for the European petrochemicals industry in the ‘80s are poor unless some remedial action can be initiated in the near future’.

Lowe did not expect any success from efforts to come to industry-wide rationalisation of manufacturing capacity or production quotas in Europe, despite ‘dark rumours’ that the European Commission would be prepared to initiate some sort of crisis scheme for rationalisation of production of petrochemicals in Europe. He considered the chances of unanimous agreement by the Council of Ministers to a scheme for planned scrapping of plants slim, because many private companies were not in favour of regulation of the industry and national schemes would be ineffective in an international industry such as the petrochemicals. Moving production facilities to the West or East was a possibility, but not without risks. For instance, how long would the high economic growth in Japan continue and on what terms and conditions would European investors be accepted in Saudi Arabia? With regard to the strategy of moving into speciality chemicals, Lowe had some pertinent questions: What is the connection with petrochemicals, and is it not dangerous to assume that specialty chemicals are inherently profitable? After all, research costs were high and success was not guaranteed. He warned against the strategy of concentrating on the more profitable product lines given the nature of co-production of products in the conventional petrochemicals complex. He ended his address by admitting that he could not pinpoint universal panaceas to remedy the problems of the European industry as he foresaw them, though perhaps some individual companies would be able to develop successful strategies.[9] Indeed, the problems of the European chemical industry would turn out to be very persistent with each hopeful recovery crushed by another cyclical downturn.

The disappointing results of the petrochemicals in the early 1980s inspired many chemical companies to focus on speciality chemicals. According to Robert Stobauch there was no precise, widely accepted definition of speciality chemicals. It was more about the product-market combination than the products itself. Whereas commodity chemicals were purchased in large volumes on the basis of specification, and with price as the overwhelming consideration, specialty chemicals were purchased in small quantities on the basis of performance, and with service as an important factor. Achieving success in specialities required a different set of skills

[9] Anthony Lowe, 'Investment strategies for the petrochemical industry', (paper presented at the European Chemical market Research Association, Cannes, 19 October 1981).

from those required in conventional petrochemicals. Engineering and operations were key aspects for petrochemicals, but speciality chemicals relied heavily on marketing and product development. Speciality chemical companies tended to be small, flexible organizations with emphasis on R&D and marketing, in contrast to the large petrochemical firms. The total sales of speciality chemicals were considerably smaller than sales of conventional petrochemicals, but in the 1980s high growth rates for speciality chemicals were expected, as well as a high return on capital employed.[10] Not only were speciality chemicals seen as more knowledge intensive, they were also considered to be less cyclical than base chemicals.[11]

Most petrochemical manufacturers, including Shell, moved into speciality chemicals. It was foreseen that Europe would not be able to compete with Middle East production of base chemicals, because of their easy access to cheap feedstock. Shell was well aware that various Middle East countries were planning to build petrochemical facilities, because Shell Oil (the US part of Shell) was involved with one of these plans. Negotiations with the Saudi Arabian government had started in 1976 and in 1983 the first unit of the chemical manufacturing facility in joint venture with Saudi Basic Industries Corporation was commissioned.[12] Shell had already some activities in the field of specialties, including catalysts and agrochemicals. Catalysts were a logical business for Shell because it used them widely in its own oil, gas and chemical facilities. It possessed valuable know-how thanks to its expertise in refining and its research capabilities in oil and chemicals. Growing demand was foreseen because of the high price in oil and the drive for energy saving in production processes. The application of catalysts improved the yield and made it possible to use lower temperatures in production processes and thus save energy. Environmental concerns also added to the rising demand, because catalysts could be used to remove impurities like sulphur from refined products. With the increasing emphasis on protecting the environment the demand for such catalysts was growing. Initially Shell Oil in the US manufactured the catalysts needed in the Shell operations, but when demand in Europe increased, Belgian Shell set up a catalyst plant in

[10] Robert Stobaugh, *Innovation and competition. The global management of petrochemical products* (Boston Mass.: Harvard Business School Press, 1988), 153-155.
[11] Interview with Jim Gordon, Shell's Group Chemicals Co-ordinator in: *Shell World*, Aug./Sept. 1985.
[12] *RD AnnualRreports*, 1976-1984.

Ghent, which opened in 1981. Two further plants followed, which served Shell affiliates as well as third parties.[13]

Of even older origin within Shell were the agrochemicals. In the 1980s Shell ranked fourth among the world's agrochemicals producers, with two important centres of research in this field: Shell Development Company's Bioscience Centre in California and Sittingbourne Research Centre in the UK. They developed products such as Dieldrin (against grasshoppers), Aldrin and Azodrin, among others for protecting cotton against mites, and the weedkiller Bladex. Since the 1960s it had become increasingly clear that agrochemicals could have detrimental effects on the environment as well as positive effects on food production. This industry found itself caught between the conflicting demands of improving agricultural production yet safeguarding public health and the environment. The launch of the insecticide Fastac in 1983 was a step in the direction of combining a high activity and broad spectrum of control with minimal environmental effects.[14] Other speciality chemicals on which Shell companies focused were two products close to their own operations: additives for luboil and oil field chemicals for enhanced oil recovery.

The oil prices collapse of 1986 changed the relative values of the specialities compared to base chemicals: with lower oil prices the threat of the Middle East was no longer so serious, and anyway, the expansion of their chemical facilities moved more slowly than expected. With low oil prices, the enhanced oil recovery chemicals, were suddenly less interesting. Saving energy and creating the highest yield were still important but less essential. Many of the enhanced oil recovery projects were postponed as they were no longer profitable. Nonetheless, Shell companies continued with investment in the speciality chemicals. The lower oil prices would contribute to economic growth more generally which would benefit all chemical activities. More takeovers followed, including the German firm in agrochemicals, CelaMerck, paid for with the profits from petrochemicals, which soared in the late 1980s. Once again the future for chemicals looked bright and new investments were planned. Shell expanded in many directions. Shell investements in polymers were considered to be of strategic importance again.The sudden rise in oil prices as a consequence of the first Gulf War, gave the chemicals one more excellent year in

[13] *Shell World*, July/Aug. 1981, no. 5.
[14] *Shell World*, June/July 1985, no. 3, vol. 10: Agrochemicals, the sense of balance.

1990, but in 1991 the tide turned yet again as another economic crisis negatively affected this sector.

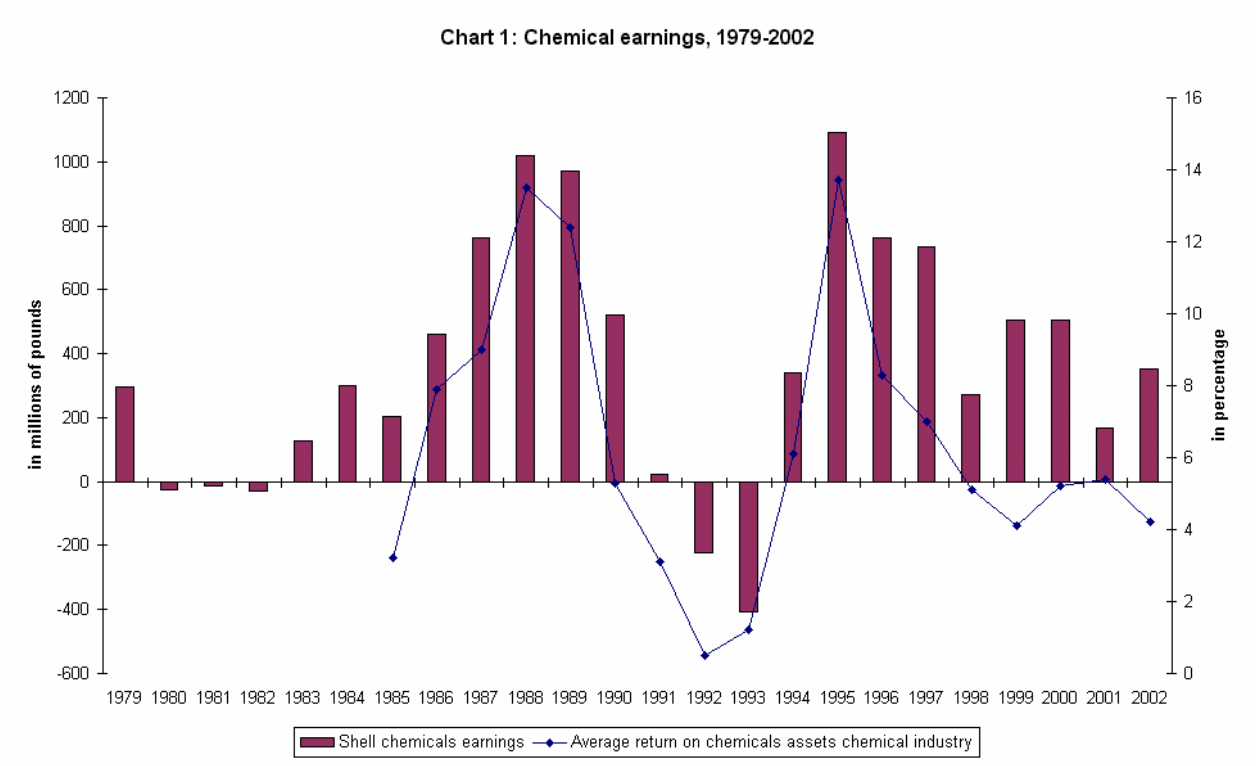


Chart 1 shows how serious the situation was during the early 1990s. (Figures for Shell before 1979 are not available).[15] Shell's earnings are compared with the average return on chemicals assets in the chemical industry as a whole (chemicals companies as well as the chemicals sectors of oil companies) to illustrate how much their ups and downs were part of the general cycle in the industry. Whatever the merits of the move into specialty chemicals, it had not succeeded in making the results of the industry less volatile. This was certainly true for Shell. If a move into specialty chemicals was not the answer, then what should be the next strategy?

'Strong restructuring with bold mergers'

The oil and petrochemicals consultant Roger Langley told the industry in 1993 not to expect a miraculous recovery. If the earlier cyclic features were to repeat themselves, the least efficient plants would be closed and there would be a recovery

[15] Shell figures: *RD/S Financial and operational information*, 1979-2000; industry figures: *Petroleum Economist*, July 2000 and July 2003.

in demand in 1994-95, but he prophesised that neither was likely to happen. He recommended 'strong restructuring with bold mergers'.[16] In fact, demand picked up after 1995, showing how difficult it is to foretell the future, even for industry experts. Evert Henkes, head of Shell Chemicals International commented in 1996 on the returning problem of surplus capacity: 'One suggested strategy to cope with this is contra-cyclical investment, but this has proved to be an extraordinarily difficult thing to do in the petrochemicals cycle, possibly because the 'cycle' may not be so predictable after all.' He added: 'There is a question as to whether it's a cyclical business, or whether it's a volatile business'.[17] Whatever it was, it certainly was difficult to make money out of chemicals. This was unfortunate, because in the 1990s shareholders in the US and Europe became increasingly vocal, pressing management to achieve high returns on investment and rising share prices. Targets of 12 per cent or more return on average capital employed were difficult to realise in a capital intensive industry such as the petrochemicals. As a consequence, companies tended to be very critical towards 'under-performing assets', selling units them off or closing them down.

In the 1990s Shell strategies were mostly shaped through buying and selling companies and business units. There did not seem to be time for internal growth or gradual transformation. Companies were bought, merged and divested again. In this Shell was not alone. As *The Economist* wrote in 1997: 'European chemical companies are splitting and recombining faster than molecules in a catalytic cracker'.[18] Behind this restructuring strategy were two main drivers. First was the above mentioned pressure of reaching a return on average capital employed of 12 per cent or more. This put the organizations under enormous pressure. Because many activities did not earn that much money there were continuously candidates for divestiture. Research was under constant pressure to become more focused and reduce expenses. The development of in-house technology only occurred where this provided a clear advantage over out-sourcing. The second driver was the globalization of markets. Companies responded by concentrating on products in which they could create a global position. Becoming market leader worldwide was the ultimate goal. This strategy implied cutting down the portfolio, because it was

[16] *Shell Petrochemicals*, number 25, 1994.
[17] *Shell World*, Oct. 1996
[18] *The Economist*, 15 Feb. 1997.

impossible to achieve leadership in a large number of products. Small businesses had to go because they could not achieve sufficient 'critical mass'. In the 1970s the supposed synergy between different activities and products had been a powerful argument to spread the net wide. This was no longer seen as a valid argument. Each line of business had to prove its value independently, and many did not stand the test. However, it would be wrong to suppose that the globalisation strategy only led to a reduction in the activities. It also led to new business initiatives in other parts of the world.

In the constant process of restructuring of the 1990s, Shell first divested its crop protection business, including the recently acquired CelaMerck by selling it to the American Cyanamid Company in 1993.[19] Next to go were the fine chemicals, mostly intermediates for pharmaceuticals or the speciality chemical industry. These were sold in 1996 to Inspec plc., a young company formed in 1992 as a result of the sale of an existing BP business.[20] Clearly BP was following a comparable divestment policy. Not all speciality chemicals, however, were divested. Two were kept: the catalysts and additives businesses. The catalysts business in Europe was combined with those of Shell Oil. Because leadership positions were considered of utmost importance, Shell did not want to continue with the additive business on its own. What was needed was 'critical mass' to make an impact on the market. The best way to achieve this critical mass seemed to be the formation of a 50/50 joint venture, incorporating the additives businesses of Shell Companies and those of Exxon. This choice was surprising, because of the strong links between additives and the lubricants business, where both parties were fierce competitors. The deal was agreed upon in 1996.[21]

Illustrative of the policy of bold mergers and divestments of the 1990s was the handling of the polyolefin business. In 1992 Shell started discussions with the Italian company Montedison to merge their world-wide polyolefins businesses (Himont), excluding those of Shell Oil in the US. The combined business would have a market share of approximately 18 per cent of the world polypropylene market. Before the new joint venture under the name Montell could become operational, the cartel authorities in Europe and the US had to finish their inquiries into the planned merger.

[19] *RD Annual Report, 1993*.
[20] *RD Annual Report*, 1996; *Shell Chemical Information Handbook*, 1998/99
[21] *RD Annual Report 1996*.

In early 1995 agreement was reached, and nearly three years after the start of the negotiations Montell finally took off.[22] The merger involved some 7000 employees in both companies and assets or businesses in fifteen countries and marketing operations in over 100 countries. With a turnover of $3 billion it was large enough to qualify for the Fortune 500.[23] Just two years later Montedison decided that petrochemicals were no longer part of their future strategy. Shell was prepared to take over their 50 per cent share because the acquisition would be a significant step towards realising their chemicals vision of becoming the leading global petrochemicals company; it was also considered useful with regard to future alliances and restructuring of the Chemicals portfolio. The acquisition was praised with the following words:

> 'In 1997 the venture's ownership passed entirely into the hand of Shell companies, thereby demonstrating their belief in the development potential of polypropylene and their determination to remain the world leader in the production and marketing of this thermoplastic.' [24]

Unfortunately, the financial results of Montell were not encouraging. It went against all managerial wisdom, which suggested that good results came from being the undisputed market leader. After having achieved its initial goal of world leadership with Montell, Shell management decided that being the number one in this business was not so attractive after all, because it also meant being very exposed. After only one year of 100 per cent ownership, in 1998 unsatisfactory financial results led to the decision to put 50 per cent of Montell up for sale as part of a large restructuring plan. In fact, finding a new joint-venture partner for the Montedison part in Montell may have been a consideration right from the start. In 1999 an agreement with BASF was reached which also included Elenac, the joint venture of all European polyethylene activities of Shell and BASF established in 1998 and Targor, the polypropylene venture divested by Hoechst to BASF. The new venture proceeded under the name Basell.[25] Apart from diminishing its exposure in polyolefins through this joint venture, Shell also divested various businesses in the groups of polymers, including PVC,

[22] *RD Annual Reports*, 1992-1995; *The Economist*, 4 Dec. 1993.
[23] *Shell World*, April 1995.
[24] *RD Annual Report 1997*.
[25] *RD Annual Reports*, 1997-1999.

general purpose rubbers, thermoplastic elastomers and resins in the late 1990s, because these activities were not in a leadership position.[26]

Even its successful high performance thermoplastic elastomer, Kraton G, was sold. This product was used in applications where an attractive feel, flexibility and durability were needed, for instance the handgrip of screwdrivers and bicycles or the housings for car gearsticks or the teats of babies' bottles. For many years, Shell only manufactured Kraton G in the US, where production started in 1974. As demand increased, Shell decided to come to Europe with this exciting product. In 1992 the building of a Kraton G plant in Berre, France, was announced and within 30 months it was ready for production. 'We had high expectations that the product would perform well and it has. The technology is very versatile and lends itself to a great deal for further development', Peter Boorman, head of Shell chemicals Europe's thermoplastic elastomer business, mentioned in 1994.[27] Nevertheless, in the big sale of 1998 Kraton G went together with the rest of the elastomer business. The constant restructuring process made the chemical business of Shell smaller and smaller without making results more robust. The culmination of the restructuring process took place in 1998, when it was decided to divest 40 per cent of the chemical business. Staff numbers in the Chemicals sector went down from 21,000 in 1997 to 10,000 in 2000.[28] In the future Shell would concentrate on the core products in petrochemicals: the major cracker products, petrochemical building blocks and large volume polymers.[29]

How had Shell fared in the meantime with its bulk petrochemicals, the production most closely related to the oil refineries? During the 1980s some reduction in capacity had taken place in the industry. The ethylene capacity in Western Europe went down from 17,060 thousand tonnes in 1980 to 15,586 in 1990, a reduction of 14 per cent (see table 1).

[26] *RD Annual Reports*, 1998-2000.
[27] *Shell Chemicals Europe Magazine*, no. 1, Oct. 1994.
[28] *RD/S Financial and operational information, 1997-2001*.
[29] *RD Annual Report 1999*.

Table 1: Ethylene capacity in Western Europe, in 1,000 tonnes	
1970	7,725
1975	13,310
1980	17,060
1985	15,586
1990	14,740
1995	18,245

Source: K.B.J. Steenbakkers, Dynamics of the European refining and petrochemical industry; strategies structure and change (KU Nijmegen, 1997), 226.

The reduction, however, was unevenly spread over the industry. The oil majors and chemical companies had reduced their capacity considerably, while the national oil companies from consumer countries had somewhat increased theirs.[30] After 1990 all groups again enlarged their capacity. Shell made efforts in the early 1980s to reduce production capacity, in particular ethylene capacity in Europe. After 1985, however, capacity increased again.[31] This rise partly resulted from improving existing plants and removing bottlenecks, and partly from new capacity coming on stream. Related to the oil and gas production in the North Sea, Shell and Esso had built a jointly owned ethylene cracker in Mossmorran in the UK, which came on stream in 1985. At the same time the older ethylene cracker and some derivative plants at Carrington in the UK were closed. In Europe Shell's efforts were concentrated on higher efficiency and the reduction of the workforce, much to the regret of the employees who had to find new jobs. One way of increasing efficiency was changing the organizational structure from one based on national organisations to one based on business units. After extensive study the European chemical activities were brought together under the co-ordination of Shell Chemicals Europe in 1994. While the decentralised organisation based on national borders had worked in the past, the growing number of international customers wanted a single point of contact in Europe, according to Jean-Pierre Meurin, the newly appointed president. Shell Chemicals Europe managed the largest petrochemical business in Europe, with 7,000 staff spread

[30] K.B.J. Steenbakkers, *Dynamics of the European refining and petrochemcial industry; strategies, structure and change* (KU Nijmegen, 1997), 226.
[31] Steenbakkers, *Dynamics* , 118.

throughout eighteen operating companies. It included twelve manufacturing sites in seven countries.[32]

Moving Eastwards

During the 1980s the Asian countries and in particular Japan displayed a rapid economic growth, which was looked upon with envy by the US and Europe. Asia seemed to be the place where things were happening, where one had to be. Shell managers too decided that it was desirable for the chemicals sector to gain access to the Asia/Pacific region, and in 1987 they started negotiation with the Government of Singapore to take over their shares in a large petrochemical complex in Singapore as part of their privatisation programme. Agreement was reached in 1989.[33] In 1994 Shell decided to make a major investment in Singapore by building a second integrated petrochemical complex consisting of an ethylene cracker, polyolefins plants, and a SM/PO plant in joint venture with BASF based on Shell technology. Though the domestic market was small, high demand was expected in regional markets.[34]

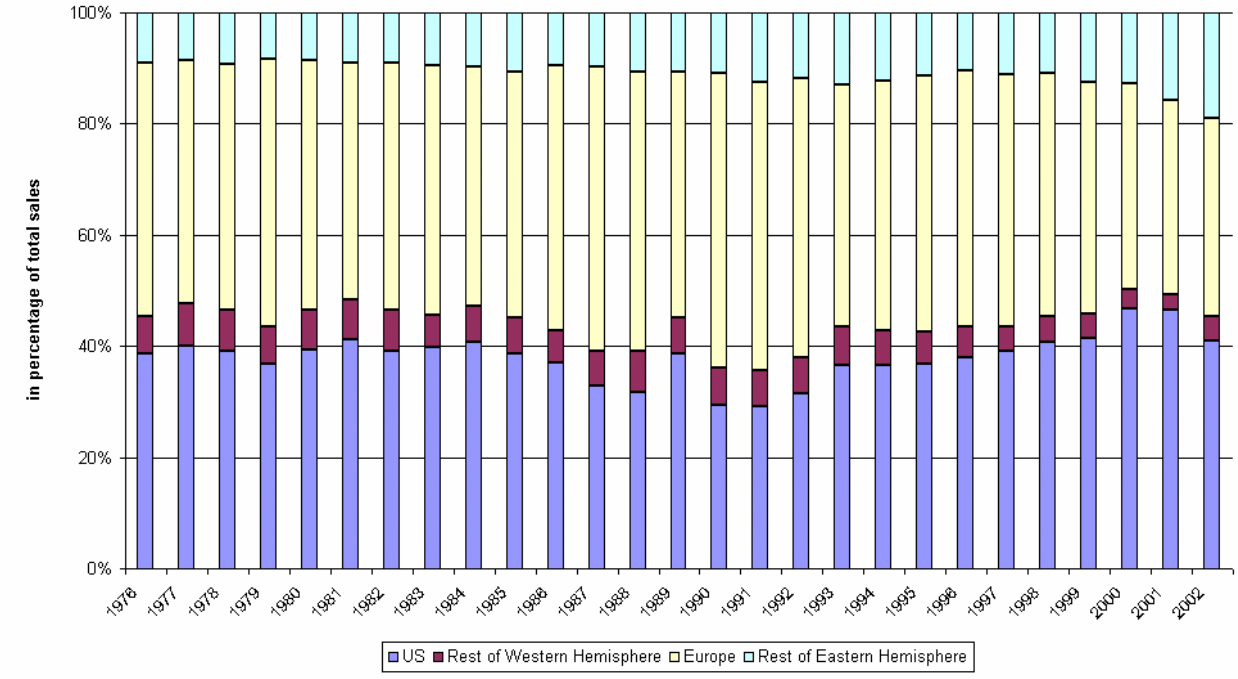
In the early 1990s the question arose whether the rapidly expanding industrial base of southern China might offer serious competition to centres like Singapore. Shell concluded that it was best to be present in both places and started a feasibility study into a refinery and petrochemical complex in the Guangdong province. The China Nanhai project took a long time to study and negotiate. Finally in 2000 Shell agreements were reached to set up a 50/50 joint venture between Shell Chemicals and the China National Offshore Oil Corporation (CNOOC) to manufacture and sell a range of petrochemicals, principally to the Chinese domestic market. It would include an SM/PO plant. The venture received the go-ahead to proceed with construction in November 2002 and the first piles were driven into the ground in May 2003. Start-up is expected at the end of 2005, and then the complex will employ 1,500 people of whom 95 per cent will be People's Republic of China citizens. The complex will

[32] *Shell Chemicals Europe Magazine*, no. 1, Oct. 1994, 15-20.
[33] *RD Annual Reports*, 1987-1989.
[34] *RD Annual Report* 1994 and 1995.

supply between five and ten per cent of the current Chinese market, which gives another indication of the size of this venture.[35]

While Shell closed or restructured plants in Europe and the USA, it built new capacity in other parts of the world, in particular in Asia. Production in the Far East was considered particular attractive because of its large potential markets. Chart 2 shows that for many years the sales of Shell Chemicals were focused on the US and Europe. Recently, however, the Shell's sales in the Eastern Hemisphere have increased, while those in Europe have fallen.[36]

Chart 2: Shell Chemicals, sales by region



In moving away for the USA and Western Europe Shell followed a general trend in the industry. This trend can be illustrated by developments in the key petrochemical product ethylene. In 1970 the USA and Western Europe had respectively 45 and 37 per cent of world ethylene capacity (excluding the Communist bloc), Japan had 13 per cent and the rest of the world a mere 5 per cent, while in 1990 the figures were respectively 35, 28, 11 and no less than 26 per cent.[37] After 1990 this trend continued, as recent figures in table 2 highlight:

[35] Shell Chemicals Magazine (www.shellchemicals.com); *Shell World*, May 2004.
[36] *RD/S Financial and operational information*, 1970-2000.
[37] Keith Chapman, 'Agents of change in the internationalization of the petrochemical industry', *Geoforum* 23 (1992): 13-27, 16.

Table 2: Ethylene capacity share by region, in percentage of world capacity

Year	1991	2002	Forecast for 2007
North America	33	30	27
Europe	25	21	20
Asia	20	27	27
Latin America	6	6	5
Middle East/Africa	7	10	15
Eastern Europe/Russia	10	6	6

Source: Morgan Stanley, cited in: P. H. Sim and R. Westervelt, 'Recovery comes into focus', Chemical Week, vol. 166, 31 March 2004, pp. 21-26.

Though the ethylene capacity in Western Europe and the USA became less important compared to other regions, that didn't imply a decline in ethylene production. In fact, the production of ethylene in Western Europe increased from 15,650 ('000 Kt) in 1993 to 20,159 ('000 Kt) in 2002.[38]

Conclusion

In 1988 one of the industry's analysts, Peter H. Spitz, posed the probing question:

> 'How could it be that an industry that fostered so much innovation, produced too many desirable consumer products, and was characterized by such remarkable growth over such a short period of time turned out to be so unprofitable for so many of its participants? Could the companies engaging in this industry have played the game differently, to reap greater advantage from the technological magic they created?'

Trying to answer his own question, Spitz first argued that over some factors the industry had no control, such as the government policies and actions, which on the one hand enforced anti-trust measures and on the other kept uneconomic capacity in place (in Europe). Also the aspirations of oil rich and other Third World countries to build up their own chemical industries was a factor outside the control of the industry. What the industry could have done, however, was being more careful with capacity additions and showing more discipline in their pricing policies. According to Spitz they

[38] Figures from the website of APPE (Association of petrochemicals producers in Europe).

should also have been less eager to seek licensing income from the proprietary technology and been more selective in the number of product lines they pursued. Writing from the perspective of 1988, Spitz thought the worse was over because the industry had shown restraint in building up new capacity. In many large chemical companies there was much greater interest in diversification through acquisitions or in entering the production of specialty and performance chemicals with higher profit margins than in producing basic petrochemicals.[39]

Unfortunately, the good years for the chemicals industry did not last long, as the phantom of over-capacity reappeared in the early 1990s and again in late 1990s. Ever longer periods of over-capacity alternated with shorter periods of profits, making it increasingly difficult to reach acceptable levels of return on investment over the whole cycle. Measured in global ethylene production, the chemical industry worldwide is still growing. The petrochemical industry as a whole is not in decline, and this is also true for the European petrochemical industry. But as a source of income for individual companies, it did not match the expectations. For those working in the industry a strong dose of optimism was required to keep battling with the cyclical downturns.

[39] P.H. Spitz, *Petrochemicals, the rise of an industry* (New York: Wiley & Sons, 1988), xiv (quotation), 541-543.