

1

Today's Chemical Industry: Which Way Is Up?*Karsten Hofmann and Florian Budde*

The chemical industry has emerged from a long struggle to sustain profitability, become leaner and more competitive, and use more sophisticated management approaches. Several eras in the industry's development have seen it change from exciting and innovative beginnings as the first ever science-based industry to its current maturity. Now a new era has begun which is once more about to reshape the world of chemicals: the era of shareholder value.

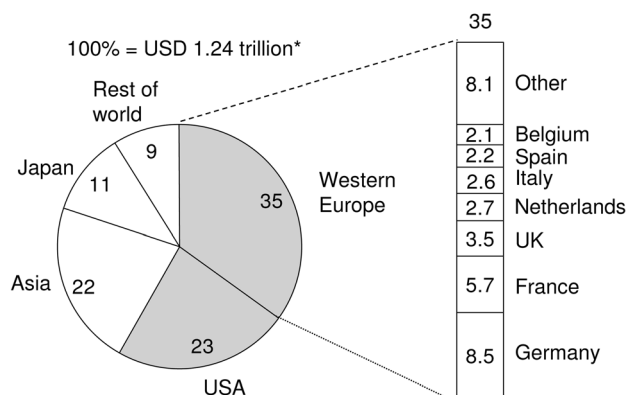
1.1

The Chemical Industry Today – A Snapshot

Today, the chemical industry is one of the largest and most diversified in the world. The total value of chemical products sold in 2003 was about USD 1.24 trillion (excluding pharmaceutical and consumer product sales of approximately USD 660 billion). Western Europe accounted for 35 percent of this, the United States for 23 percent, and Japan for 11 percent (Fig. 1.1). Within the OECD member states, chemicals and petroleum products make a larger contribution to GDP than any other manufacturing industry. In Western Europe, chemicals account for approximately 1.3 percent of the total economy.

The chemical industry consists of hundreds of segments with an estimated 70,000 different product lines manufactured by more than 1,000 large and mid-sized companies, plus countless very small ones. The sector can be characterized as consisting of many “mini industries” of varying sizes, and it counts virtually every other industry among its customers – from agriculture to construction and electronics (Fig. 1.2). The automotive industry, for example, relies on several different chemicals in the production of tires, seats, dashboards, and coatings, to name only a few major components.

Percent

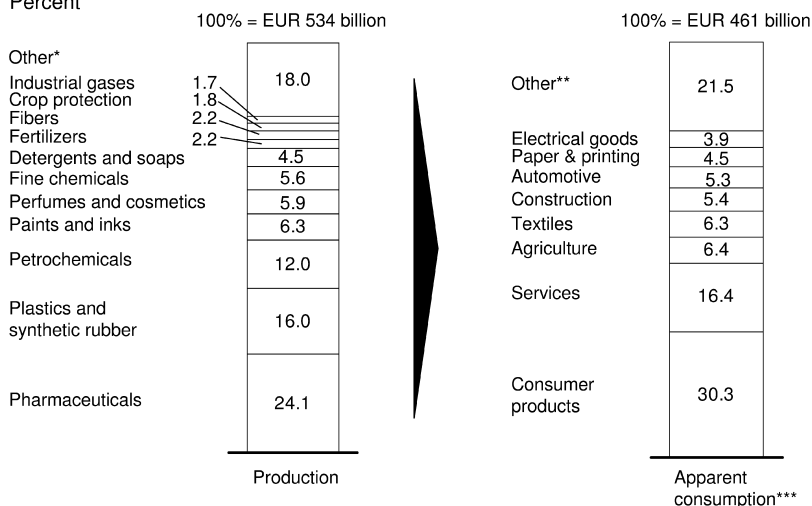


* Excluding drugs & medicines and soap & cleaning preparations

Source: WEFA-WIM

Fig. 1.1 Total chemical output by region, 2003.

Percent



* 14.2% other specialty chemicals, 3.8% other basic inorganics

** Includes, e.g., metal products, industrial machinery, office machines

*** Apparent consumption (EUR 461 billion) = production (EUR 534 billion) – net trade balance (EUR 73 billion)

Source: CEFIC

Fig. 1.2 Production and consumption of chemicals – Western Europe, 2003.

Chemical products can be roughly segmented into basic chemicals, polymers, specialty and performance products, industrial gases, and agrochemicals. However, for practical purposes they are usually classified as “commodities” and “specialties”, the latter having higher value added and distinctive key success factors that allow for some additional differentiation between competing products. Albeit this distinction is commonplace in the industry, it should be kept in mind that chemical commodities are not nearly as commoditized as true commodities such

as copper or crude oil, and therefore still offer much more opportunity for differentiation than these. Since chemical businesses are very heterogeneous, the range from “commodities” to “specialties” is a continuous spectrum.

Growth rates in the mature markets of Western Europe and the United States tend to be close to that of GDP – the minimum rate to maintain significance as an industry in the general economy over time. However, there is significant growth in the emerging markets. In China and South East Asia in particular, the industry’s growth rates have been impressive and are also forecasted to remain higher than the growth of GDP (e.g., 9.8% per annum compared with 7.3% per annum in the period from 2003 to 2010 in China, 7.0% per annum compared with 5.3% per annum in Malaysia).

For the period until 2010, annual double-digit growth of chemicals output is projected for China and for Asia excluding China and Japan (Fig. 1.3). Since China is expected to remain a net importer of many chemicals far beyond 2010, this demand will also drive output growth in other regions where domestic demand is only increasing slowly.

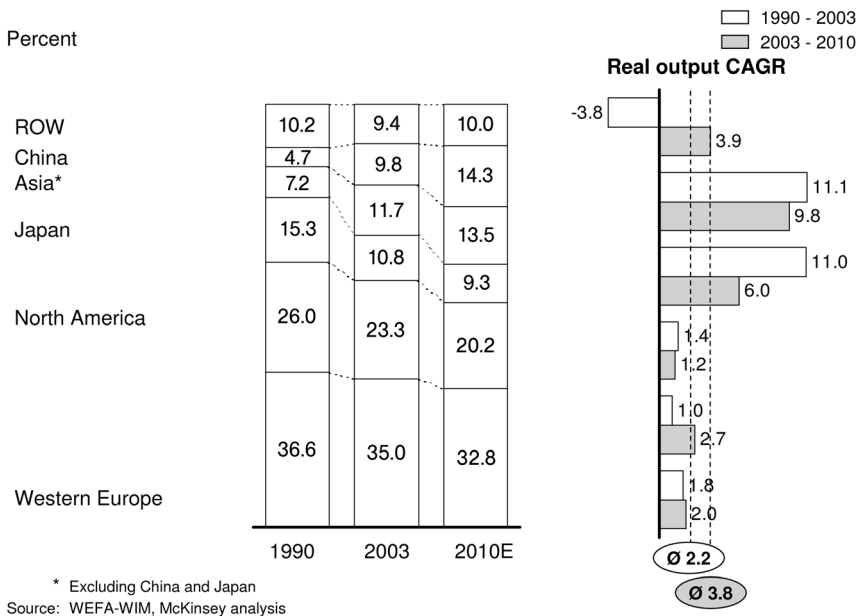
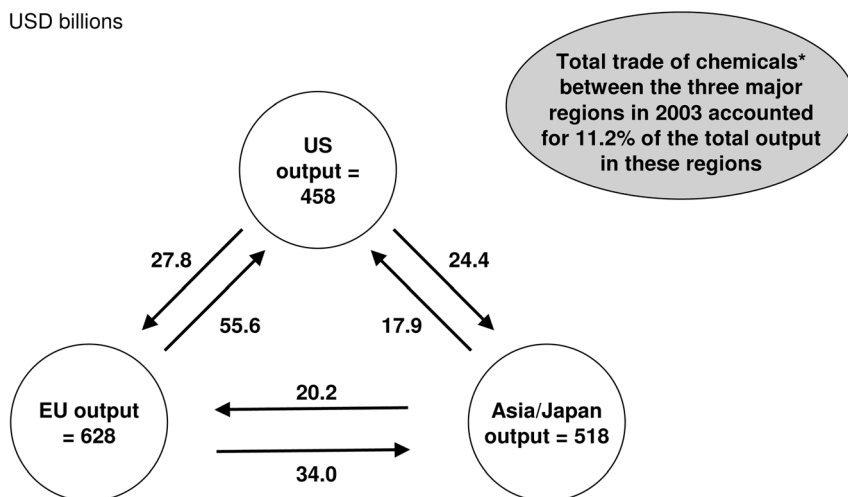


Fig. 1.3 Global chemicals output by region, 1990–2010 (nominal gross output, excluding drugs & medicines and soap & cleaning preparations).

The top players in the chemical industry are as global as any of their counterparts in other industries. Almost 40 percent of the sales of the top ten chemical companies originate from overseas countries. The comparable number for the top ten automotive and electronics firms is roughly 30 percent, and for the top pharmaceutical and oil companies around 50 percent. The industry has a distinctly

regional character, however, in the sense that there are only limited trade flows between the three main manufacturing regions (North America, Europe, and Asia including Japan). Only 11.2 percent of total output in 2003 was shipped between the three regions (Fig. 1.4).

USD billions



* Including pharmaceuticals and consumer products (e.g., detergents, cosmetics)

Source: CEFIC

Fig. 1.4 Inter-regional chemicals trade, 2003.

Not surprisingly, inter-regional trade is particularly limited for volume products, which are relatively expensive to transport. Nevertheless, the limited inter-regional trade is sufficient to couple prices and industry cycles in the different regions worldwide. The prices of basic commodity plastics, for example, moved in remarkably close harmony in all three regions for the last 25 years.

In most places, however, trade within the regions is very strong. For instance, 55 percent of the European Union's total chemicals output in 2003 was exported within the region (including Central and Eastern Europe); 20 percent of it was exported outside Europe; and only 25 percent was consumed domestically.

Germany and the United States are the world's largest exporters of chemical products. In 2003, Germany exported USD 99.0 billion's worth and the United States USD 91.4 billion's worth. However, the United States is a net importer of chemical products overall while Germany is still the largest net exporter (Fig. 1.5).

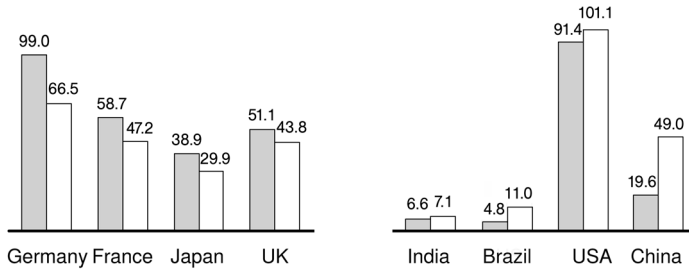
Trade patterns for chemical products differ markedly from those of overall trade. Countries like China and Taiwan, for example, which have large surpluses in their overall trade accounts, have sizeable deficits in their trade in chemicals. The United States and Britain, on the other hand, have large trade deficits overall, but trade surpluses, or at least somewhat balanced trade flows in chemicals.

USD billions

Chemicals exports*
Chemicals imports*

Net chemicals exporters

Net chemicals importers



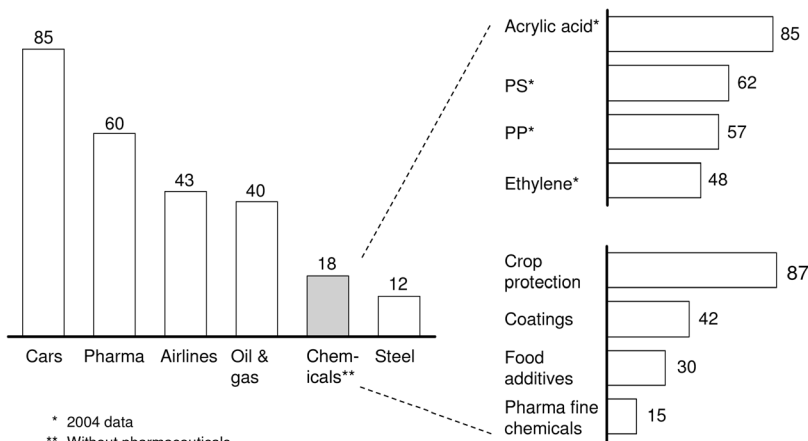
* Including pharmaceuticals and consumer products (e.g., soaps, cosmetics)

Source: ACC

Fig. 1.5 Chemicals import/export balance of major economies, 2003.

As mentioned above, one interesting aspect of the chemical sector is that the industry as a whole is highly fragmented. The top ten companies in chemicals (excluding pharmaceuticals) account for only 18 percent of the total market, well below comparable values in other industries, such as automobiles, where the top ten firms account for 85 percent of sales, or pharmaceuticals, where the top firms account for more than half of all sales (Fig. 1.6). While the overall consolidation level is low, several product segments have already consolidated. The top ten manufacturers of acrylic acid, for instance, account for 85 percent of their market. The top ten manufacturers of crop protection products account for 87 percent of their market, and the top ten in paints and coatings for 42 percent.

Percent



* 2004 data

** Without pharmaceuticals

Source: McKinsey analysis

Fig. 1.6 Concentration level of the chemical industry – top ten worldwide market share, 2003.

The level of concentration in the industry also varies by region, with North America in general showing the highest concentration and Asia the lowest. For acrylic acid, for example, the top four manufacturers in the United States account for the whole market there. In Western Europe the top four account for 98 percent, but in Asia (excluding Japan) they account for only 63 percent of the market. The comparable figures for the top four producers of polystyrene in North America, Western Europe, and Asia (excluding Japan) are 84 percent, 72 percent, and 37 percent respectively.

There are plenty of other examples (e.g., polypropylene and HDPE) where the Herfindahl Index, a measure of industry concentration frequently used by anti-trust authorities, is rather high in North America and Western Europe. This necessarily limits the opportunities for Western players to grow by means of mergers and acquisitions in their own domestic markets.

The large number of Asian players in several industry segments often results in sub-scale plants with inefficient operations. The average plant size of an acrylic acid manufacturer in Asia (excluding Japan), for instance, is less than one-fifth of the average size of a corresponding plant in North America. It should be noted, however, that since Asia is the major growth region for the chemical industry, the Western players' scale advantage will quickly diminish as new world-scale plants come on-stream in Asia over the next few years. In ethylene or polypropylene, for example, the five largest plants in East Asia will measure up to their North American and Western European counterparts or even surpass them in terms of average size by 2008.

Nine of the top ten firms in the industry are Western, and for the best part of the last two decades of the twentieth century there was little change in the names appearing in annual lists of the top ten. Eight of those in the 1980 listing, for example, also appeared in 1998 (Fig. 1.7).

Changes in line-up of chemical players*		
1980	1998	2003
1. Hoechst	BASF	Dow
2. Bayer	DuPont	BASF
3. BASF	Bayer	DuPont
4. DuPont	Dow	Bayer
5. ICI	ICI	Total
6. Dow	Hoechst	ExxonMobil
7. Union Carbide	Shell	BP
8. Shell	Akzo Nobel	Shell
9. Exxon	Exxon	Mitsubishi
10. Montedison	Elf Aquitaine	Degussa

Major MA&A changes since 1998

- Hoechst and Rhône-Poulenc spun off their chemicals businesses (Celanese and Rhodia) and merged the life science parts to a new entity (Aventis)
- Mergers of oil companies
 - Exxon and Mobil
 - Total, Petrofina, and Elf
 - BP and Amoco
- Mergers of chemical companies
 - Dow and Union Carbide
 - Degussa-Hüls and SKW

* Chemical sales only
Source: C&EN, McKinsey analysis

Fig. 1.7 Changes in top ten chemical companies.

However, between 1998 and 2004, some dramatic shifts occurred as the result of a number of large mergers and acquisitions. On the one hand, Hoechst and Rhône-Poulenc spun off their traditional chemicals businesses (to become Celanese and Rhodia) and merged their life science divisions into a new entity named Aventis, now part of Sanofi-Aventis. On the other hand, several other companies – mainly oil-based – merged their businesses in order to gain economies of scale. The result was that several new names appeared around the turn of the century in the top ten: BP Amoco, ExxonMobil, and TotalFinaElf. The top ten line-up continues to see major changes as Total, BP, and Bayer are spinning off major parts of their chemical businesses, i.e., Arkema, Innovene, and Lanxess, respectively. The acquisition of Millennium by Lyondell will propel another North American player into the global top ten list.

Despite the regional structure discussed earlier, all the top ten giants are truly global companies with large parts of their business in each of the three main regions. In addition, the portfolios of products manufactured by these giants are very diverse, with the major conglomerates ranging from primarily commodity players to hybrids which operate at all levels of the industry, with Degussa the only one of the group to focus entirely on specialty chemicals.

The management challenges in each of these major categories differ considerably. In Chapter 3 we will return to these and describe the potential strategic choices for the chemical industry.

1.2

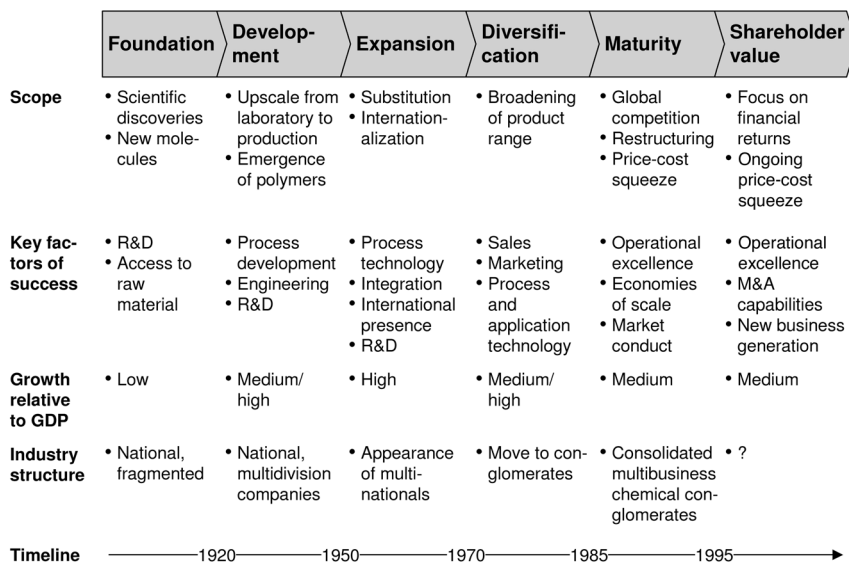
Eras of the Chemical Industry

Early chemical companies can be compared to the upcoming software and computer giants of the 1990s: new, innovative, and completely revolutionary. The industry remained exciting and attractive until as recently as the last twenty to twenty-five years, but with increasing maturity and declining innovative potential it has come to be regarded as somewhat dull, a less attractive investment or employment prospect. What, then, does the future now hold?

It may be useful to set the scene for our analysis of the chemical industry's current situation and future challenges by taking a brief look at its evolution, and, in particular, by outlining our understanding of the changes in general industry dynamics in the various chemical businesses over the past decades and up to the present day.

Industrial historians trace the origins of today's chemical industry back to the discovery in 1856 of a synthetic process for manufacturing mauve dye. Before that date, chemical production was largely confined to the unsophisticated processing of inorganic compounds found in the ground, and was little more than an offshoot of mining. The discovery of this organic dye, by the Englishman William Henry Perkin, marked the beginning of the world's first science-based industry.

From the moment of Perkin's discovery until today the development of the chemical industry falls into six major eras, during which it has been transformed into the world's largest manufacturing industry, now indispensable to almost every manufacturing process (Fig. 1.8).



Source: McKinsey

Fig. 1.8 Era analysis chemical industry.

Foundation: In this era the chemical industry was putting down its roots. As the industrial revolution had created demand for many chemical products such as dyestuffs, this period was characterized by the discovery of new molecules, based for the most part on different types of hydrocarbons. In addition to R&D, access to raw materials was the key success factor. With the development of the coal industry in the nineteenth century discoveries were plentiful. This was the starting point of many national chemical companies which still exist today as global players. Production during this period, however, was small-scale and fragmented.

Development: The industry then moved out of the laboratory and into the factory. The emphasis shifted from discovery to large-scale organized production. Engineering and process development became as important as chemical R&D. The Haber-Bosch ammonia process was the leading example of a catalytic process operated on a large scale, requiring important advances in process design and engineering. Companies in the industry began to develop more sophisticated multidivisional structures, and growth began to accelerate. One important reason for that was the emergence of polymers: most of the modern mass polymers like polystyrene, PVC, polyethylene, and polyurethanes were discovered between 1930 and 1940.

Expansion: Chemical companies grew rapidly as a result of the increasing substitution of synthetic products for natural materials. Plastics, in particular, replaced natural products such as paper, wood, or cotton in many applications, as they were cheaper and easier to process. Based on the importance of crude oil as a raw material for nearly all organic chemicals, large integrated chemical complexes like those in the North American Gulf Coast region or Rotterdam and Antwerp in Europe were established, and economies of both scale and scope became important. Another major trend was that the chemical companies began to spread outside their home markets. True multinational organizations began to emerge, as international presence became as important to success as scientific discovery and process development.

Diversification: Companies broadened their product ranges even more widely. The key to success here switched from R&D to processes and application technology as well as customer service. This change resulted in the build-up of strong customer service and technical support departments. This was the stage when many players were transformed into chemical conglomerates, with highly diversified product portfolios ranging from commodities through specialty chemicals to pharmaceuticals. The industry's growth rates – still well above GDP – decreased, however, after the oil crises (1973 and 1979).

Maturity: The creation of new products slowed down and the industry became more focused on global competition between firms. It was harder for companies to grow faster than GDP, and they were forced to achieve operational excellence through aggressive restructuring and cost control. The number of mergers and acquisitions began to accelerate in order to consolidate the industry and to achieve further cost synergies through economies of scale.

Shareholder value: In this most recent phase the main focus is on financial returns, that is, on the value created for investors. M&A activity in the industry continues to be on the surge. It is mainly driven by the need of established players to focus on the most promising parts of their portfolios to create value for their shareholders. This translates at the same time into disinvestment of non-core assets and into bolt-on acquisitions to strengthen existing core platforms. Private equity players, who are responsible for a good share of chemical M&A, are playing an important role in demonstrating that significant hidden value is still waiting to be unlocked.

Obviously, these six eras have occurred at different times in different parts of the world. In addition, the degree of participation has varied. In the early years, Europe led the way. Britain and Germany, with the USA joining in from the 1920s onwards, mainly drove the foundation and development phases of the industry. The expansion, diversification, and maturity eras took place in Europe and the United States at more or less the same time. They occurred in Asia rather later and somewhat less intensely. The era of shareholder value, however, came first and fastest to the United States. European firms have followed their US counterparts into this phase in the last ten years, and the same is currently happening at many Asian companies.

To understand this recent evolution and the perspectives for the chemical industry, it is essential to understand the capital market point of view, which drives the strategies of most global chemical players today. The importance of the shareholder value era for the chemical industry is discussed in the following two chapters.

1.3

Summary

In the early years of the shareholder value era, the current status and past development of the chemical industry are outlined:

- The chemical industry is one of the world's largest and most diversified, consisting of many "mini industries" of varying sizes.
- Its growth is close to GDP, the minimum rate to maintain significance as an industry over time. However, there is significant growth potential in the emerging markets, particularly China and South East Asia.
- The top players are global companies, although the industry has a distinctly regional character.
- Though some major mergers and acquisitions have occurred, the industry is still very fragmented in most segments
- The authors define six major eras of the chemical industry from its foundation through to maturity, ending with the most recent phase in which the focus is on the value created for investors – shareholder value.