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The Expected Effects of the EU Accession on the Chemical industry in Hungary

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Table of content

Introduction*

This report is part of an ample study, to analyse the impact of EU enlargement on Eastern European industry sectors. The objective of the study is to identify whether the chemical industry in Hungary will be able to withstand the competitive pressure resulting from accession to the EU. This pressure could arise from the increased competition of EU producers in a unified market, or from the requirements of EU membership such as a functioning market economy or compliance with environmental standards.

Considering that current and expected developments in the European chemical sector continue to significantly influence the future of the Hungarian chemical sector, the study presents the European chemical industry in a relatively detailed introduction, detailing (for relevant subsections) the medium and long-term prospects. The study identifies and discusses trends in the past decade for each of the major segments, and offers some industrial view on how these trends may evolve in the near and medium term future.

We have analysed the accession primarily in terms of regulations also covering the expected future concerning the European regulations. Considering the economic impacts, the study is dealing with a lesser extent with the accession's impact to the growth, FDI and trade since the accession regarding these areas has practically happened and therefore it won't have a significant impact. However, the study discusses in details the expected effects on market structure and competitiveness.

The study examines the above effects for different subsections within the industry, using the breakdown applied in the EU and Hungary. The classification is based on generally accepted industry groupings and results in relatively homogenous segments for which generalised findings can be made. The segments can therefore be studied meaningfully for competitiveness and also offer an insight into how the drivers for restructuring differ between segments. Being covered by a separate study, we do not separately detail the pharmaceutical sector. Due to its importance in Hungarian economy we touch on the oil industry as well.

Elaborating this report we used information provided by the Hungarian Central Statistical Office (CSO), Facts and Figures Book of European Chemical Industry Council (CEFIC), the European Commission, and the Hungarian Chemical Industry Association (HCIA) as primary sources. In addition we relied on official comments and researches published by CEFIC and the European Commission. Despite the importance of the topic of EU enlargement, the number of adequate sources to gain information on enlargement effects of specific industry segments is limited. In this context we have to emphasise the importance of the Chem Systems' study, "Competitiveness of the Chemical Industry Sector in the CEE Candidate Countries" from 2001; the "White Paper on the strategy for a future Chemicals Policy" elaborated by European Commission in 2001, and "Competitiveness of the Chemical Industry", elaborated by the European Commission.

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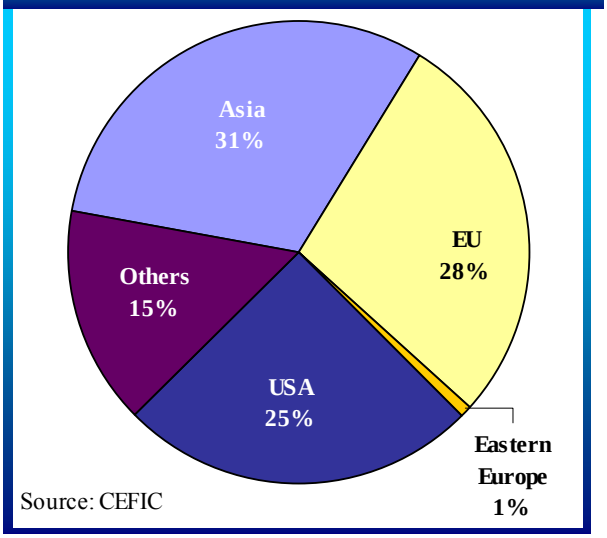
I. Position and structure of chemical industry in EU and Hungary

1.1. Where are we going? The EU chemical industry

1.1.1. Position of the European Chemical industry

According to the European Chemical Industry Council (CEFIC) contemplating in a broader sense (incorporating the pharmaceutical industry) the world's chemical production was estimated close to EUR 1,900 billion in 2001. The chemical production was the third largest in the global industry following the Food & Drinks and Automotive sectors. The chemical industry is one of the EU's most international, competitive and successful sectors, embracing a wide field of processing and manufacturing activities. With an output of close to EUR 600 billion, Asia is the leading chemical producing area in the world, followed by the European Union and North America, each of these producing chemicals valued more than EUR 500 billion. Taking all together Asia, the European Union, and North America account for 86% of global production. Total chemical production of Eastern European countries was roughly EUR 20 billion, only 1.4% of total world production

Figure 1.1.
Geographic breakdown of world chemical production



Value added:

The EU chemical industry accounts for around 12% of EU manufacturing industry's gross value added. In the EU chemical sector is the leading manufacturing sector in terms of "value added per employee", followed by the transportation equipment and the paper&printing product sectors. The chemical industry's contribution to the EU's GDP amounts to 2.4%. This may seem small at first sight, but should be reassessed by taking into consideration both the shrinking contribution of the industry as a whole to the GDP in advanced economies, and the wide penetration of chemical products into all branches of the economy.

The European Union is the world's leading exporter and importer of chemicals accounting for more than half of the global trade. In 2001, 29% of chemical sales were exported outside of the EU area, mainly to North America and Asia. In spite of the increasing trend of chemical exports (in 1990 the export ratio was only 15%), the principal cornerstone of the EU's chemical market remained the internal market. Sales on the internal market accounts for more than 70% of total sales therefore the internal economic environment is the all-essential factor influencing the chemical demand.

The EU chemical industry comprises of about 23,069 **enterprises**, 94% of which have less than 250 employees and may be considered as small and medium- sized enterprises. These account for 25% of sales and 28% of employment. The concentration of chemical industry is substantiated by the fact that only 6% of the EU enterprises employ more than 250 employees but generate some 75% of the total sales. In spite of the concentration of the chemical industry (mainly due to petrochemicals) the small and medium sized enterprises (SMEs) play a vital role in the chemical industry as a whole and overwhelmingly

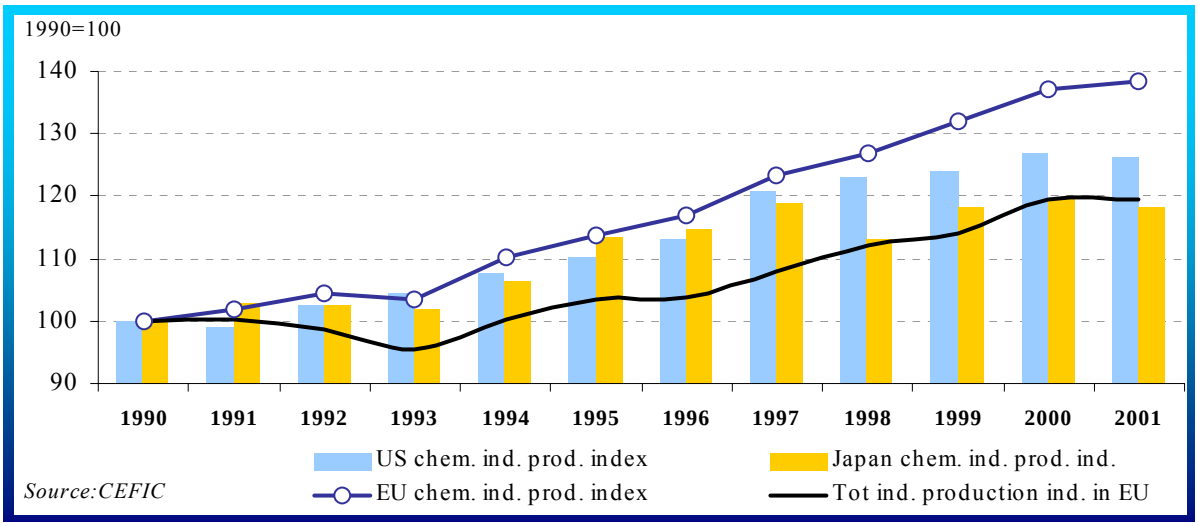
characterise sectors such as paints, speciality chemicals, cosmetics, basic pharmaceuticals and plastic processing.

In 2001, the world's 30 largest chemical majors - of which 15 have their headquarters in the EU - accounted for 29% of world chemical sales. These companies had a combined sales turnover of EUR 543 billion.

1.1.2. Chemical production and cost-structure

Because of its close relationship with the economy as a whole, the chemical industry follows a similar **cyclical pattern**. In the 1991-93 recession, the EU chemical industry was more resilient than the industry as a whole and the ensuing pick-up was stronger for chemicals. In the EU over the years of 1991-2001, chemical production (4.6%) grew more quickly than domestic consumption (2.4%). The growth rate of exports exceeded that of the imports; and therefore the trade surplus increased over time.

Figure 1.2. European chemical growth



Over the period of 1996-2001, chemical production grew stronger in the EU than in either the US or Japan. The chemical industry has a wide range of products, with varying growth rates. Pharmaceuticals spearheaded the growth of the EU chemical industry over the period of 1995-2001. By contrast, consumer chemicals and basic inorganics grew at a much modest rate.

The last two years have been difficult for the chemical industry in Europe. Due to the economic downturn, chemical production/consumption, excluding pharmaceuticals shrank considerably. For the first time in many years, the EU chemical industry's output (without pharmaceuticals) experienced negative growth in 2001. Moving from 2000 to 2001, chemicals without pharmaceuticals experienced a slowdown in growth rate by more than 5 percentage points. In sectorial breakdown a big output decline was in the Man-made fibres (-5.3%), other chemical products (-4.3%) and paints (-2.8%). These segments were predominantly affected by the shrinking US economy. The basic chemical segment with the largest share within the chemical industry remained effectively unchanged.

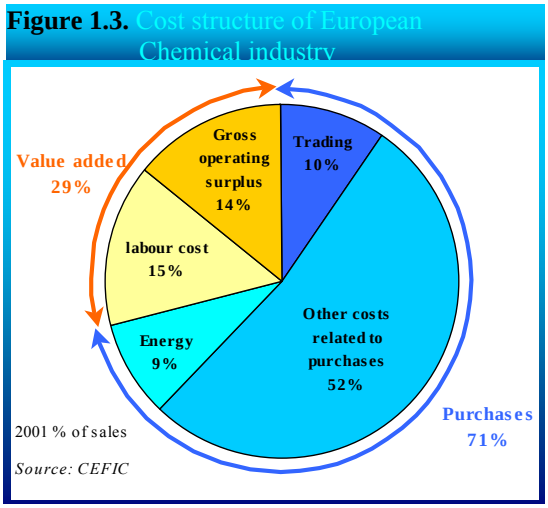
In 2002 the industry performed relatively well, in H1 outperforming the gloomy predictions after the weak 2001, but the second half of 2002 was hit by inventory de-stocking as business sentiment deteriorated through the year and demand slowed in major economies. In line with the rising oil prices (driven by geopolitical uncertainties and the unusually cold winter) and strengthening Euro against US dollar (hitting European exporters), the general outlook for the European chemical industry remains negative

on short term. A slow recovery is expected from the second half of 2003 (in line with expected pick up in the US economy).

1.1.3. Cost-structure and competitiveness in the industry

The cost structure of European chemicals is weighted on the purchase costs, enhancing the sector's cyclicality. Purchases by the EU chemical industry account for 71% of the sales value. The remaining 29% constitute the gross value added of the sector, which comprises gross operating surplus and payroll. Among purchases, it is possible to single out the costs of trading and energy. Trading represents the cost of chemicals purchased from third parties and resold in their original condition, and amounts to 10% of the sales value. Direct energy costs currently account for 9% of the sales value.

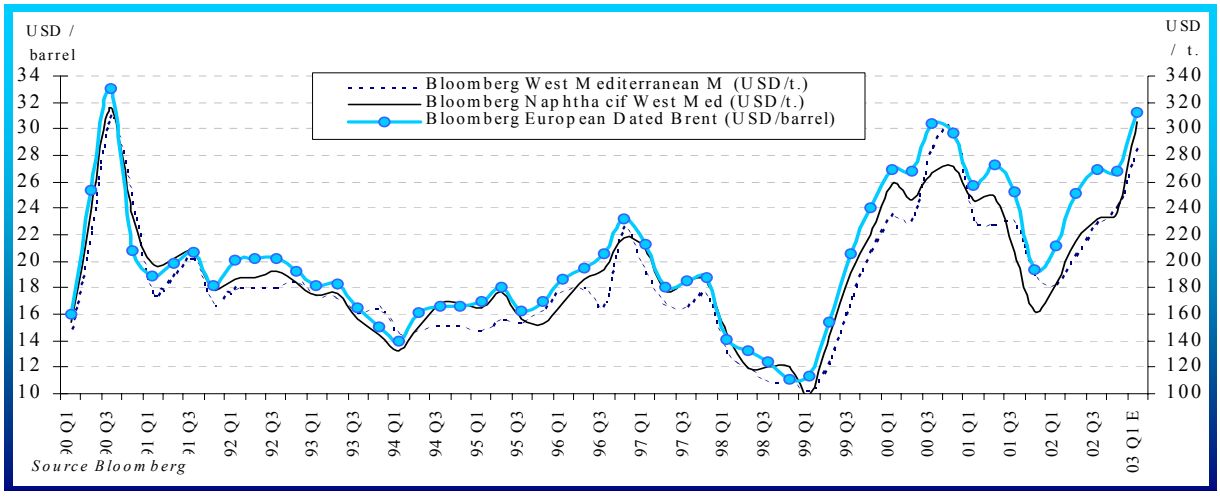
Figure 1.3. Cost structure of European Chemical industry



However, the figure exceeds the 50% for many basic chemicals. Due to this cost structure the efficiency of chemical sector depends largely on chemical margins.

The principal **raw materials** for chemical industry are deriving from **crude oil and oil products** like naphtha, gas oil, heavy and gaseous mineral oil fractions and natural gas. The cost of these inputs is a prime factor in competitiveness on world markets. In the long run the oil prices vary basically in function of demand/supply balance, but in the shorter run the factors influencing the market sentiment (mainly geopolitical factors) can have significant effect on the prices too. Due to these factors the price of crude oil showed an increasing volatility at the end of decade.

Figure 1.4. Oil prices and oil product prices



OPEC controls the one-third of the world supply (75-80 million barrels per day), but due to the geopolitical risks appearing in the last few years; the importance of non-OPEC producers (mainly Russia) has improved considerably. In spite of this, currently the most important tool for controlling the oil prices, the **adjustment of exploration** is still in the hand of the OPEC countries. The optimal price of crude targeted by OPEC is considered between 22 and 28 US$/barrel.

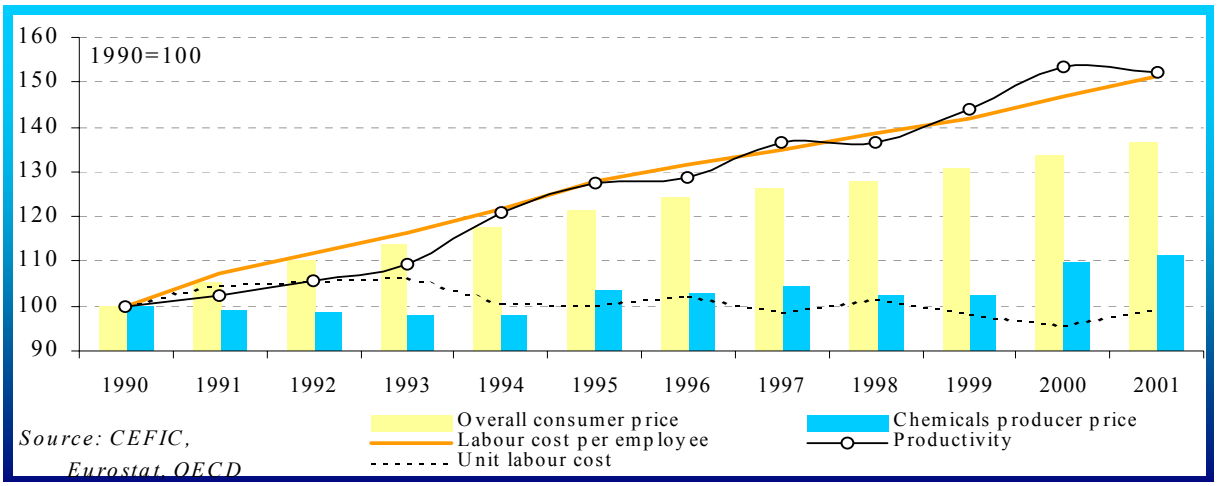
On demand side the most important consumers of oil are the OECD countries lead by the US, which consumes more than one third of the global supply. The main effects from supply side depend on the phases of economic cycle of the above mentioned consumers.

Following the September 11, 2001 events the geopolitical factor driving the oil prices has increased in importance. This fact explains the contradiction, that despite of stagnating/deteriorating economic performance in the developed world, oil prices are continuously rising since the end of year 2001.

Besides crude oil, the chemical industry also purchases a broad variety of natural or processed basic materials. From the **energy** sector, it consumes coal, oil products, natural gas and electricity, using them both as raw materials (feedstock) and as fuels. The cost of these inputs is an important factor contributing to the competitiveness on world markets. For many years, the EU chemical industry has made strong efforts to improve energy efficiency, reducing its fuel and power energy consumption per unit of production. As a result of these efforts energy consumption per unit of production was halved since the 1980's. The energy efficiency is subject to decreasing returns; meaning that from a higher level of energy efficiency attained it is more difficult to make further improvements. In addition, the EU chemical industry has a handicap of competitiveness compared to that of the US, because European chemical firms pay significantly more for its energy than their US counterparts. The average energy price difference over time reflects changes in prices of individual fuels, their mixes and exchange rates. This identifies the need for governments to liberalise energy markets in Europe and reducing taxes on energy.

Compared with the EU overall consumer **prices**, which rose by one third over the period between 1990-2001, chemical producer prices increased by just 11%. During this period the chemical margins were volatile with a narrowing trend, therefore the improvement of the competitiveness of the European industry was possible only with rigorous control of influenceable costs. The major factor of competitiveness from this point of view was the increase in labour productivity.

Figure 1.5. Prices and productivity in EU chemical sector



Labour cost per employee in the EU chemical industry increased by an annual average rate of 4.2% over the years 1990-2001. The impact of labour cost increases on profitability were more than offset by substantial productivity gains, especially so since 1994. Labour costs per employee in the EU chemical industry were significantly lower than in the US, (by nearly 43% in 2001) but on the other hand, the yearly working time was shorter in Europe (an estimated 1,648 hours against 1,966 in the USA). Labour costs per employee in the Japanese chemical industry are closed to the European level, thus from this point of view EU and Japan has a competitive advantage compared with US. Unit labour cost in the EU chemical industry was practically unchanged the last decade, whereas it rose in the US and in Japan.

Labour productivity in the EU chemicals industry rose by more than 4% annually over the period of 1991-2001. The labour force employed in the chemicals industry is more qualified, better trained and paid than the average industrial worker is. Personnel costs for the EU chemicals industry are 54% higher than the average for all other manufacturing sectors.

1.1.4.Capital spending and R&D activities

Capital spending and R&D costs in the chemical industry vary largely within industry subgroups. The capital spending ratio and R&D spending ratio (to sales) in the pharmaceutical sector exceeds the same ratios in the basic chemicals sector. Overall the capital-spending ratio in Europe (5% of sales) is considerably lower than the same ratio in Japan or in the US.

Due to several factors: significant economic uncertainties, limited appetite for acquisitions; companies consolidating former large acquisitions; companies focus more on internal cost-reduction and cash-generation; and continuous high (though recently declining) valuations for chemical assets, the capital spending ratio and M&A activity was stringent in 2002 as well.

A number of companies have now rebuilt their balance sheet, and investments in capacity extensions are expected to decrease. These factors may result in a greater level of acquisition activity during 2003.

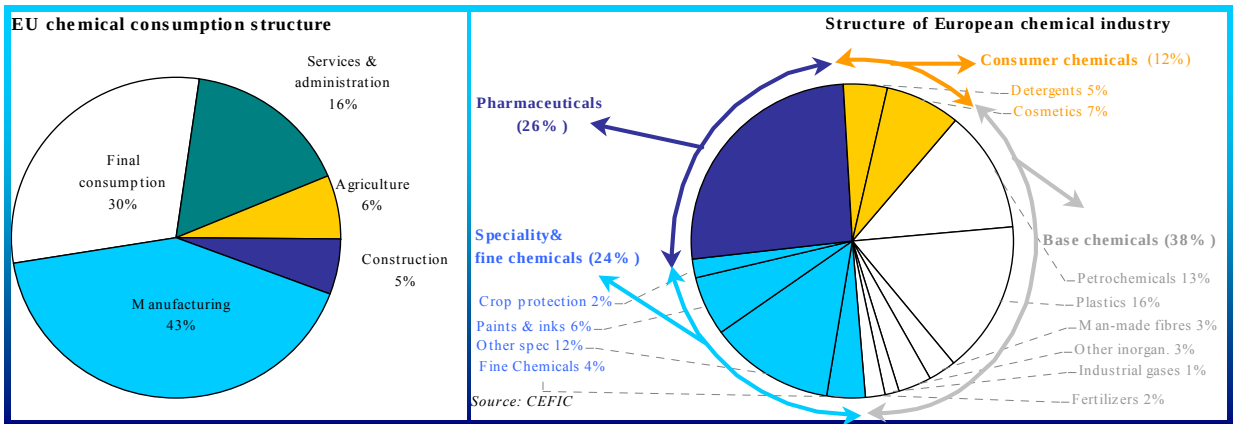
After an investment intensive period in the eighties capital expenditure to turnover ratio has been decreasing in the last decade, and has stabilised at around 5% in the recent years. Compared with other regions of the world the investment activities in European chemicals could be considered less active.

1.1.5.The structure of the industry

EU chemical demand in 2001 was estimated at EUR 453 billion, 19% of which originated from outside the region - mainly from North America and other Western European countries.

The chemical industry supplies virtually all sectors of the economy. Although initially, the major share (30%) of chemical products is further processed within the industry itself. In other words, the chemical industry is its own largest customer. In many instances, it is only after several processing stages that the products go to outside customers.

Figure 1.6. Structure of the Chemical industry



The chemical industry is very heterogeneous in character. Its principal activity is chemically transforming materials into diverse substances with new chemical and physical properties. Its main sectors can be grouped into: basic organic and inorganic chemical products; fertilisers and nitrogen compounds; basic

plastics and synthetic rubber; pharmaceutical and medical products; speciality chemicals, which include agrochemical, and special polymers; paints, vanishes and coatings; cleaning and polishing preparations; perfumes and toiletries; and man-made fibres. The industry is divided into two **upstream sectors**: basic inorganic chemicals and petrochemicals (or basic organics), while the rest of the sectors are **downstream**.

The upstream sectors' outlets are almost exclusively the downstream sectors. The base chemicals sector is the largest sector in the European chemical industry accounting for 34% of total production. The pharmaceutical segment has the second largest share of production. This study will generally not cover the pharmaceutical sector, which is already the subject of a separate report.

a. Base chemicals

Petrochemicals and polymers

The petrochemicals segment covers the areas of chemical processing that are downstream of the oil refining industry. The majority of the chemicals produced in this sector are intermediates, which are further processed, mostly in the petrochemical segment. Key products include: ethylene, propylene, benzene, ethylene glycol, methanol, phenol, acetic acid, acrylic acid, solvents. General characteristics of the petrochemical business include[1]:

- High capital intensity and large economies of scale,
- Global, cost-based competition with significant inter-regional trade,
- Dominant importance of feedstock costs (can offer substantial competitive advantage),
- Low R&D expenditures (as a percentage of sales),
- Globalisation of company activities and markets,
- Relatively low overall margins, reflecting the cost based competitive environment and large numbers of producers,
- Cyclical earnings,
- Current major trend to industry rationalisation and restructuring.

Global growth in the quantities of commodity petrochemicals since 1985 has tracked or exceeded GDP growth.

Table 1.1. World Petrochemical Production in 2001

Product (Kt)	Asia	Western Europe	North America	South America
Ethylene	17,162	19,674	27,807	3,505
Propylene	11,538	13,157	14,141	n.a.
Benzene	8,491	7,530	7,234	892

***Source**: International Petrochemical Information Forum*

Major companies concerned: BASF, DSM, Basell, Ineos Group, Dow, Acetex, Borealis and the major oil companies (Shell, TotalFinaElf, Statoil, BP, Eni). Due to the vertical integration of this segment, the above mentioned companies are not "pure" petrochemical companies.

Ethylene, with global production at about 100 million tonnes, is the petrochemical industry's core building block from which over 60% of other organic chemicals are derived. Within Western Europe, naphtha (derived from crude oil) is the key raw material for ethylene and polyethylene is the principal end-market accounting for around 60% of demand. The price evolution of naphtha along with the supply/demand balance for ethylene is the key drivers for ethylene pricing. Due to the stagnating demand in 2001, average growth slowed down to about 2.2%.

[1] Industrial Restructuring in the Chemical Industry, Final report prepared for the EC DG III-C-4

Ethylene capacity expansions peaked in 2002 while the projected capacity expansions for the period of 2003-2005 have been reduced. Accordingly, the loading rates probably will exceed 90% of capacity for the period until 2004. Further consolidation of projects may be expected, in line with industry consolidation that took place at the end of the year.[2]

In Europe **Propylene** is produced mainly from steam crackers. More than half of end-use markets is polypropylene and acrylic acid. Propylene consumption is forecasted to grow at 3.7% per year, reaching 16.56 million tones in 2006. Western European propylene capacity is forecasted to reach 17.55 Mt by 2006, an increase of 1.21 Mt over the capacity in 2001. On average, net imports are forecasted to remain in a band from 300kt to 350kt. However, given that consumption is seen to grow faster than production "capacity", it is quite probable that imports will significantly exceed these levels. [3]

[2] Forecast of CEFIC published on petrochimistry.net

[3] Forecast of CEFIC published on petrochimistry.net

Table 1.2. Petrochemical and polymer capacities in Europe

(Kt)		1997	1998	1999	2000	2001
Ethylene	Capacity	20,080	20,821	21,009	21,650	22,166
	Production	18,537	18,980	19,362	19,402	19,624
	Utilisation of capacities	*92%*	*91%*	*92%*	*90%*	*89%*
LDPE	Capacity	5,575	5,605	5,622	5,859	5,839
	Production	4,845	4,836	4,795	4,810	4,680
	Utilisation of capacities	*87%*	*86%*	*85%*	*82%*	*80%*
HDPE	Capacity	4,495	4,655	4,726	5,330	5,600
	Production	4,065	4,242	4,308	4,500	4,575
	Utilisation of capacities	*90%*	*91%*	*91%*	*84%*	*82%*
Propylene	Capacity	14,691	15,311	15,519	15,786	16,339
	Production	12,633	12,897	13,315	13,511	13,420
	Utilisation of capacities	*86%*	*84%*	*86%*	*86%*	*82%*
Polypropylene	Capacity	7,563	8,105	8,280	9,303	9,237
	Production	6,440	6,890	7,414	7,500	7,575
	Utilisation of capacities	*85%*	*85%*	*90%*	*81%*	*82%*

Source: petrochimistry.net

In the longer term (up to 2007), new **capacities** are expected to be built mostly in the Middle East (especially Iran and Saudi Arabia) which is expected to add anywhere between 7-10 million tonnes of new capacity, depending on whether all these projects actually go ahead or not. Many of these projects are integrated with new ethylene and propylene derivative capacities that will be largely targeted to the Asian (in particular Chinese) markets.

Consolidation in the European petrochemicals market could continue over the last few years resulting in a further improvement of the big integrated oil's market share. The mid-sized, non-integrated chemical companies divesting their petrochemical operations could accelerate the integration.

Commodity **polymers** include polyethylene, polypropylene, PVC and polystyrene. They are used in applications that include film for packaging, injection-moulded household goods, pipes, building profiles, containers, coating and fibres. Global market growth has been strong in the last decade, averaging above five percent a year. Although there is differentiation between grades of any polymer, competition is strongly price-based. In addition, technical service is important in securing market share and satisfactory pricing.

Decreasing demand in the last few years results in an erodation of capacity utilisation in Europe's polyolefins industry. During the second and third quarters of 2002, markets appeared to be improving with capacity utilisation rates rising from the mid-eighties to the low nineties, and volume growth for polyethylene and polypropylene. This surge was only temporary linked to inventory restocking and margin improvements and have not been as substantive as expected, given the need for polyolefin producers to compensate for higher naphtha and ethylene prices over the summer. Due to the expected slow demand and the potentially growing supply, 2003 may not bring around the awaited improvement for the industry.

As a response to competition with capacity based on cheap feedstock (especially producers in the Middle East) EU polymer producers have been consolidating increasingly. As a result of this defensive consolidation Shell and BASF joint-ventured their operations into Basell, Solvay and BP swapped and joint-ventured some of their polymer activities, DSM sold its petrochemicals business to SABIC and ENI looked for a buyer for its chemicals business. Currently the number of key players on the European market has been reduced to 6-7 from up to 15 in the first part of eighteen's. The integration has made the European players more competitive compared to major US companies. Vertical integration enables

rationalisation and management of the total supply chain, and enables smaller numbers of large companies to invest in world scale capacity.

Inorganics

The inorganic sector covers many chemicals, ranging from sulphuric and nitric acid to chlorine, sodium hydroxide and titanium dioxide. The **chloralkali chain** is the largest of the inorganic chemicals. Chlorine and caustic soda are produced together in similar production volumes. Due to different demand cycles pricing for these two can be highly volatile with often chlorine and caustic prices moving in different directions.

The **chlorine-caustic chain** has been dominated by environmental concerns, with chlorine and some of its derivative products (eg. PVC) considered by many to be harmful to the environment. In addition, the still predominant utilised technology in Europe although producing a high-purity product, consumes a lot of electricity and also poses environmental concerns due to the possible discharge of mercury into the water. European environmental legislation is forcing a phase-out of mercury-cell based facilities by 2010 and this will result in plant closures and clean-up costs as well as in some cases significant new investments into alternate chlorine production facilities.

Fertilisers

The fertiliser industry manufactures products containing one or more of the primary plant nutrients, nitrogen, phosphorus and potassium. These are used as compounds with various different substances, depending upon local raw material and processing options plus market needs. **Nitrogen based** fertilisers represent by far the most important sector, accounting for over 60 percent of nutrient demand, with the most important product groups as calcium ammonium nitrate, ammonium nitrate, urea and ammonium sulphate.

Due to unfavourable factors influencing the agricultural production European consumption of fertilisers has seen a gradual decline in the past years. This is expected to continue the result of the restructuring of the EU's Common Agricultural Policy, which had previously encouraged over-production of food.

The European industry looks increasingly uncompetitive against those regions, which have access to low cost feedstock. This, combined with static or declining regional demand and a sustained period of depressed pricing and consequent low profitability have led to a significant decline in the European production of fertilisers. For nitrogen based fertilisers, the industry is tending to relocate to the Middle East, while phosphate production is increasingly located close to deposits of phosphate rock, principally in the US and Africa.

Key downstream sub-sectors

The **man-made fibres** sector comprises of two important sub-groups: "cellulosic fibres" and "synthetic fibres"'. The synthetic fibres group is by far the more important, accounting for over 90 percent of man-made fibre demand globally.

The fibres industry in general is low growth and can be almost entirely classed as a commodity business. New developments can behave more like a speciality for a period but competition and other developments quickly erode such advantage. In the industrial sector, end-uses range from commodity to speciality as increasing technical demands reduce somewhat the dominance of price considerations. However, even in this sector price pressures are severe. The automotive sector is a demanding and generally low margin business for suppliers; the result of a powerful and concentrated customer base, which is itself intensely, cost competitive.

There is extensive competition within the fibres industry, both between natural and man-made fibres and between the individual fibre types within these groups. In Western and Central Europe, production of synthetic fibres has been static or in decline for a decade. The industry is vulnerable to the imports both of fibres and of finished textiles from low cost producing regions, of which Asia is the most important.

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The **detergents** business together with parfumes and toiletries amounts for around 12 percent of total chemical industry turnover in Western Europe. The detergent industry contains large volumes of substantially similar products. Consumer advertising plays a substantial part in marketing for the major soapers and also there is a constant trend toward convenience. This brought about innovations from powders to supercompact powders, from liquids to gels, from granules to tablets. The production technology has changed in recent years. It uses 80 percent less energy and 200 litres less water per ton of product compared with the use in the first part of last decade. It also allows the use of ingredients such as percarbonate and enzymes, which permit lower temperature washes and have a reduced environmental impact. Manufacturers in the EU can demonstrate compliance with requirements of biodegradability of surfactants by presenting documents.

The **industrial gases** segment is predominantly based on the air gases (oxygen, nitrogen etc) but welding gases and speciality gases are also important.

b. Speciality and fine chemicals

The specialities segment consists of those businesses that take raw material from "basic" chemicals segments, such as petrochemicals or inorganics, and convert them into "active" ingredients for use in consumable products. The segment can be further split into fine chemical and performance chemical sections.

General characteristics of the specialities business include:

- Capital intensity is low.
- The products tend to be produced in small volumes in
- A larger number of small companies than other segments in the chemical industry.
- In many instances companies in the segment are based on a single product line, for which they have developed a leading technology position.
- Increasingly this fragmented market of small companies is rationalising as speciality conglomerates are created which allow the companies to reduce the cost of common items in the business.
- Due to global consolidation the number of major customers is reducing

The **fine chemical** section includes companies that manufacture specifically defined active chemicals for use in areas such as the pharmaceutical segment. The fine chemicals industry is an industry sector that produces typically small volume, customer specific molecules that are used largely in the pharmaceutical and agrochemical industries (combined accounting for 70-80% of global fine chemical production). Fine chemical production can be a fairly capital-intensive process with success often driven by access to a variety of technologies, flexible (and regulatory- approved) production facilities, and close interaction with major customers right from the initial stages of drug or crop molecule discovery. Fine chemical companies mainly compete on quality of product and cost of production. As they have little influence on the end use to which the chemicals are put, there is a tendency for the products to behave like commodity chemicals.

The fine chemicals industry had until last year been characterised by high-growth and high-margin sector with a significant M&A activity. As a result of consolidation today, the top seven global fine chemical producers all come from Europe. Recent consolidation has led also to rationalisation in research and excess in-house fine chemical production capacities. In addition, the pharmaceuticals industry is currently going through a cyclical downturn. As a result of these trends, fine chemical producers could confront at least temporarily lower growth rates and weaker margins (arising from stronger competition) than originally expected.

Performance chemicals are those produced to satisfy well-defined performance requirements. These chemicals are critical to the performance of the end products in which they are used. This could include additives (for the food & beverage industries), catalysts (to accelerate chemical reactions), emulsifiers (for the soaps industry), high-performance polymers, or UV protection ingredients for suncreams to name just a few products. This type of customer relationship provides a good barrier against substitution, however it does make the supplier more vulnerable to the success of the customer business. Considerable effort needs to be put into technical service to ensure that the customers keep their competitive advantage, which can be a significant cost item.

In recent years a lot of European companies moved away from commodity chemicals (where often price is the key differentiator and strong competition) to speciality and performance products having higher margins and greater cashflow stability.

The paints and coatings industry is generally a GDP-growth sector selling largely into the decorative, automotive and industrial sectors. The three leading European paints/coatings producers (Akzo Nobel, ICI , and BASF) have generally differing target markets and strategies with ICI being predominantly a decorative paints producer, BASF with a core focus on the automotive market and with Akzo Nobel, the world's largest producer, present in almost all the consumer and industrial markets (but excluding automotive).

In particular in decorative paints, the industry is faced with generally higher marketing and distribution costs than in the US (and hence typically lower margins) given the still fragmented brand loyalties and distribution networks across the European countries. There is still a continuing trend towards more environmentally friendly water-based coatings (and associated enhanced performance standards for these water-based coatings) which means that in some niches growth rates can be in excess of GDP resulting from substitution away from solvent-based applications.

The dyes industry is driven largely by demand from the textiles industry and a competitive supply coming from Asia. Three European players – Dystar, Ciba Specialties and Clariant – account for just under 50% of the global market with the remaining industry largely fragmented and increasingly dominated by small Asian producers. Industry demand is largely driven by fashion trends with the highest growth likely to come from the polyester-based textiles. The industry is a mature one with a stable future.

The agrochemical industry comprises largely the companies producing crop protection products (herbicides, insecticides, and fungicides) as well as agriculture biotechnology (genetic modification of crops to improve their resistance qualities or provide desirable traits).

The crop protection market is a very mature industry with typically 0-1% volume growth rates. The global sales in crop protection industry have been contracting for fourth consecutive year. Agriculture biotechnology is a much higher growth market segment, benefiting those companies that provide genetically modified products in regions where they have been accepted (such as North America, Brazil, India, etc.). The agrochemicals generally act on a competitive market with lower margins, being characterised by a lower capital intensity compared to other segments and by raw material price sensitivity. In addition, the industry is generally impacted by "cycles" brought about by changing weather patterns, crop price developments, and evolving government subsidies.

Over the medium-term, the EU agricultural policy could reduce subsidies for farmers driving to a lower demand for crop protection products. In longer-term, the big opportunity remains the potential for increasing use of biotechnology for crop modification, including the development of "output traits" (such as lower calories or increased vitamins in crops) which could result in a pick-up in growth rates and stronger profitability levels for the industry.

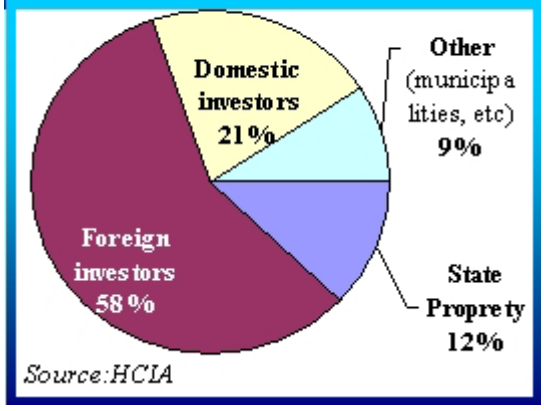
1.2. The Hungarian chemical industry

The Hungarian chemical production (including pharma) is still the second in importance after the engineering industry. The production value of domestic chemical industry was HUF 1,744 billion in 2002, accounting for 13.8% of total industrial production and 10.6% of GDP.

During the socialist era Hungary's chemical sector became overdeveloped providing chemical products to the other "fraternal countries" with its products. Many large investments took place in the 1980's using up to date technologies that are why some of these projects proved to be viable many years later. After the introduction of the market economy the chemical industry has been restructured, some capacities have been closed, and privatisation has started.

Privatisation of the chemical industry took place in several stages and practically ended in 1998. In 1999 the share of state property corresponded to 12 percent only. State ownership was left only in case of a few specific branches of the industry considered strategically important. Foreign capital amounts to 58 percent, higher than the industry average.

Figure 1.7.
Ownership structure in chemical industry, 1999



After the privatisation the ownership structure of different industry segments is still changing. Taking into account Hungary's geographical conditions it was important for market participants to gain strong positions in Hungary being ahead of the accession. Petrochemical sub-sectors have been characterised by the change in the production structure, since the ownership structure has already been stable in the other sub-sectors, dominated by Western European companies. Strategic investors are present in several sectors, such as paints and coatings, detergents, fibres, and pharmaceuticals. Due to the vertical integration in the ownership structure of large polymer companies, financial investors have been replaced by strategic investors, however cross investment between Hungarian producers also exist.

Production declined dramatically after 1990 reaching the bottom in 1992. Stagnation and slow decline in the production was characteristic ever since with the only exception in 1997 when the industry seemed to be set on a rising course. The Russian crisis hindered again production in 1998—99. Production volume at constant prices is currently by around 15-20 percent below the 1992 level. The general decline in production affected certain branches of the industry in different ways: for example the pharmaceutical industry lost from its importance.

Table 1.3. Production of the most important Hungarian chemical products

Chemical product (Kt.)	1985	1990	1995	1996	1997	1998	1999	2000	2001	2002	AAGR 01/96
Sulphuric acid	520	244	103	90	84	64	53	68	74	n.a.	-3,6%
Ethylene	271	234	270	277	331	315	300	352	359	365	5,9%
Propylene	177	167	200	202	232	228	203	250	248	n.a.	4,6%
Tot. plastic raw materials	389	615	742	749	865	856	861	1043	1030	n.a.	7,5%
Polyethylene	56	221	274	242	299	289	262	286	292	307	4,1%
Polypropylene	98	155	137	137	132	136	128	294	260	278	18,0%
PVC granulate	170	186	194	188	258	249	234	269	267	275	8,4%
Nitrogen based fertiliser (active agent)	604	470	186	250	195	225	186	198	269	n.a.	1,5%
Phosphate based fertiliser (active agent)	110	56	23	18	42	51	38	40	42	n.a.	26,7%
Insecticide (active agent)	36	24	8	10	9	8	8	8	8	n.a.	-4,0%

Source: Hungarian Chemical Industry Association, Inter-Európa Bank Rt. estimation

Currently the Hungarian chemical sector leans on three major pillars, each of which gives roughly one third of the production. The major pillars are the petrochemical, the pharmaceutical and the plastic processing segments. Prior to the transition, the Hungarian **pharmaceutical** industry was the strongest in CEE and was the dominant segment of the Hungarian chemical industry. The importance of the pharmaceutical sector has declined after restructuring, and moreover this segment was strongly affected by the Russian crisis. After the consolidation, Hungarian pharma companies become one of the biggest beneficiaries of the growth in Russian markets.

Currently the **petrochemical, polymer and plastic** sectors give the largest part of the Hungarian chemical production. The restructuring over the last decade resulted in the closure of some capacities even in these sectors, but the remaining production plants appear to be broadly competitive, however it has left space for further investments. In spite of the reorganisations the production of these segments remained relatively stable.

The downstream sectors - paints, detergents, and fibres - are also fairly strong with a dominant presence of foreign strategic investors. Hungary has a tradition and expertise in the fine chemicals business. Rationalisation has been undertaken in fertilisers, with the closure of some units and therefore one other area of decline has been fertilisers, fine chemicals and agrochemicals.

The Hungarian exports of chemicals accounted for a large proportion of output in 2002, but there is a net trade deficit within the industry. The EU is by far the largest trading partner, accounting for around half of the exports and two thirds of the imports.

Table 1.4. Hungarian chemical trade, 2001

		Exports	Imports
EU	percent	48%	67%
Other Western Europe	percent	3%	3%
Central Europe (CEFTA)	percent	22%	10%
Former Soviet Union	percent	9%	5%
Total	EUR billion	**2,85**	**4,33**

Source: Hungarian Chemical Industry Association

Due to its export orientation, the chemical industry is strongly affected by the evolution of Hungarian currency against the Euro. After the change in the monetary policy the chemical sector has suffered from the strengthening of the forint.

Though a considerable part of Hungarian chemical export is orientated to the EU (being accounted in EUR) a large part of the export is accounted in dollar, thus the strengthening EUR against the US dollar could cause considerable losses for Hungarian players. Most of the Hungarian chemical companies are still not hedged against the currency risk.

Similarly to the European chemical industry the structure of the Hungarian industry is characterised by a large extent of concentration. The Hungarian chemical industry employs around 79,000 workers (not counting pharmaceuticals) and around 34,000 workers are employed in the production of chemical materials and products in 112 enterprises. Around 80 percent of employment is in large enterprises, employing 300 people or more.

The major petrochemical and polymer producers are located in the region of Miskolc (Northeast of Hungary), with other industry close to Budapest and in the Western part of the country.

1.2.1. Oil industry

Hungary has limited indigenous reserves of oil and gas, which supply a minor proportion of its needs, therefore more than 75% of Hungarian oil and gas consumption is imported primarily from Russia through pipelines. Although some efforts were also taken to seek gas and oil sources from Croatia (via the Friendship pipeline) or Western European sources (via HAG pipeline), but the Russian energy is more competitive (in term of its price) compared with the other potential sources.

MOL, the largest Hungarian company by sales is a leading integrated oil and gas group in the CEE region. As the Hungarian energy monopoly MOL is the sole importer of gas and the leading oil and gas producer and oil processor, the company is a top market player on the Hungarian retail and wholesales market of oil products and is also a determinant player on the regional markets. MOL was partly privatised, 75% of its shares being owned by private investors. The remaining 25% stake and the golden share still entitles the state to control the company. MOL produces annually more than 1000 Kt. crude oil and some 3000 m^3 natural gas. After restructuring its international upstream business MOL focuses its production activities primarily to the participation in the development of Russian oil fields. MOL intends to increase upstream integration by doubling its crude oil production by 2005 within tighter and more competitive cost targets. The company's oil processing capacity is 165,000 barels crude per day and its main refinery is working with close to 80% capacity utilisation. Rationalisation of refining and logistics asset base and modernisation of retail network has been completed. Refinery yields improved significantly through the investment in the delayed cocking unit. In its medium term strategy MOL's aim is to increase the ratio of end user consumption within refinery production to over 50% of group refining capacity primarily by expanding its retail network in the region. MOL targets a group retail network of 1000 stations by 2005. MOL also strengthened and extended its core businesses by the successful establishment of partnerships with Slovnaft and TVK. In the Petrochemical segment MOL intends to capture 7% regional polymer sales growth. The company plans to meet this target by investing in new production capacity at existing petrochemical sites and by the full exploitation of potential MOL-Slovnaft-TVK synergies in this area. MOL maintains its goal to spearhead oil industry consolidation in the CEE region in the coming years. Currently, it's shortlisted with two other suitors in a bid for a 25% state-owned stake in the Croatian oil and gas company, INA. It's also signalled an intention to bid for the Czech state-owned petrochemicals and oil company Unipetrol AS, as soon as it comes up for sale probably this year.

MOL's shares are listed on the Budapest and Luxembourg Stock Exchanges and traded on London`s SEAQ International system. Revenue was around EUR 4.6 billion in 2002, with EBITDA margin at 11 percent. Consolidated MOL staff number is close to 10,800.

1.2.2. Petrochemicals, polymers and plastic

Ethylene is the **petrochemical industry**'s most important feedstock followed by Propylene. These commodity chemicals are sold to a common specification, often via an integrated pipeline system, and thus can not be differentiated by producers in terms of performance/quality characteristics. Production and supply economics thus constitute the only significant factors determining the success of the producer. In Hungary similarly with other Central European countries commodity petrochemicals are the basic building blocks of the chemical industry. Crackers are linked to refineries, which provide feedstock. However, there is a shortage in naphtha in the majority of the region, which is forecasted to be continued. This has impacted utilisation; also the new capacities will use mostly gas oil.

MOL supplies refined products to the only cracker (ethylene plant) in Hungary, operated by Tiszai Vegyi Kombinát Rt. (TVK). TVK uses its ethylene and propylene to produce polyolefins. Ethylene is also supplied through pipeline to BorsodChem (BC) for the production of PVC. These three companies - MOL, TVK and - dominate the petrochemicals and polymer sectors in Hungary. Integration of these companies could be accelerated by the strong technological link between them. TVK and BC need more ethylene than the cracker can supply and currently import the deficit. There is an ethylene pipeline from Kalush in Ukraine. TVK has announced an expansion project that would supply additional ethylene to fill this gap.

TVK is responsible for around 20 percent of the petrochemical capacity of CEE region, and is the leading supplier of the region's polyethylene and polypropylene market. This dominant player in the domestic olefin and polyolefin market exports nearly 50% of its total annual sales mostly to European markets. As an ethylene manufacturer, it is BC most important supplier. TVK's most important raw material supplier (naphtha and gasoil) is MOL. The oil company owns (directly and indirectly) a controlling stake in TVK.

As a result of its petrochemical development project TVK is almost doubling in size, and is reaching a scale that will guarantee the company a long term leading position in the CEE region, further strengthening its presence in the European Union. This almost doubles the quantity of chemical base materials that can be acquired from MOL. At the same time, BorsodChem purchases the greater volume of ethylene sold by TVK in order to provide for new functions implemented there. The existent cracker and polyolefin plants of TVK - LDPE, HDPE, PP -employ good Western technologies such as Linde, BASF, and Phillips. The plants are relatively new, dating from 1970 to 1999. The average tehnological level of the company could improve due petrochemical development project putting world class technologies into operation.

TVK is traded on the BSE. Revenue was around EUR 550 million in 2002, with EBIT at 6.3 percent. Consolidated TVK staff numbers are close to 2,136.

BorsodChem (BC) is also situated in northeastern Hungary, at Kazincbarcika and it is a determining chemical player of CEE region. BorsodChem is the largest producer of PVC and the only MDI and TDI producer in Central Europe. The majority of its products are exported mainly to the EU. The company produces PVC in an integrated production chain starting with its own chloralkali plant and imported ethylene. BC must also import some VCM (vinyl chloride) offset the current mismatch between VCM and PVC capacities.

BC, which previously dealt with PVC production only, successfully combined the synergies of the PVC chemical line with those of the chlorine industry belonging to isocyanate chemistry. The company has a PVC production capacity of 320 Kt./year and a vinyl-chloride capacity of 185 Kt./year. BC made strong efforts to broaden the range of its products and moving the product structure in the direction of less cyclical non-commodity products. The company implemented capacities to produce raw materials (MDI

and TDI) in the polyurethane-line. Production of MDI started in 1991 based on technology imported from Mitsui. In 2002 Borsodchem started to produce TDI in a new plant with a capacity of 60 Kt./year.

Table 1.5. Production of major products

Kt.	PVC	VCM	MDI	Aniline	TDI
2001	266.9	219.6	50.5	84.7	7.1
2002	275.1	190.0	53.6	93.3	50.4
Change (%)	3.1	-13.5	6.1	10.2	

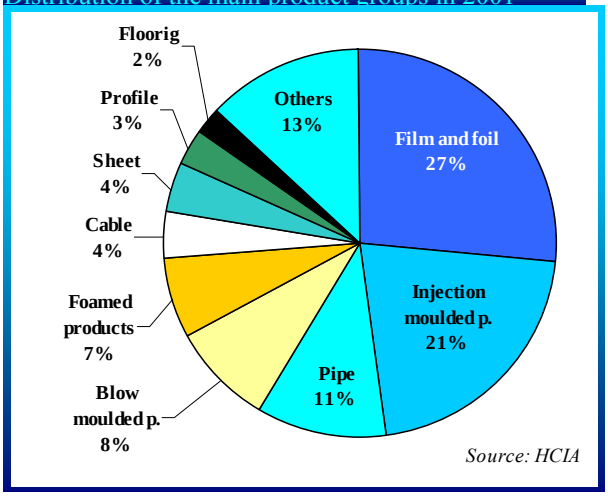
For the years between 2003 and 2005 the company plans further capacity expansion investments. The development program includes the expansion of the vinyl-chlorine producing capacity from 180 to 250 Kt./year. Parallel with this BC is also starting a program to increase its VCM capacity to 320 Kt. The project is scheduled to be completed by the second quarter of 2004, prior to the commissioning of chemical firm TVK's ethylene cracker. For the subject project BC will use Krupp Uhde and VinTect license know-how and equipment. The company also plans further new acquisitions along the chlorine production chain and to double the MDI capacity from its current 60 Kt. by 2006.

BC has also shown interest in acquiring other Central European producers like the Czech MCHZ purchased in 2000. In this way the newly established BC-MCHZ became a stable source of raw material for the expanding MDI production.

BorsodChem is a publicly quoted entity, currently owned by Russian (Gazprom) linked investors. There is a strong interest from these investors to expand their control in the other Hungarian chemical company TVK (controlled by MOL). Revenue of BC amounted around EUR 500 million in 2002, with EBITDA margin at 15.6 percent. Consolidated staff number of the company is 4,134 workers.

Both TVK and BC are close to finish restructuring activities. They outsource some non-core operations and rationalised their staff numbers. In spite of several staff reductions these companies remained far behind of Western European companies (with higher volumes of production) in terms of revenue per employee. However, lower Hungarian wage levels result in lower fixed costs per ton of product. These companies are currently success stories both, in the Central European context and in Hungary. There are some structural disadvantages in terms of feedstock costs and the size of the domestic market, but the companies are well placed in terms of both their physical assets and their business approach.

Figure 1.8.
Distribution of the main product groups in 2001



Concerning the Hungarian petrochemical industry, 2002 was one of the most unfavourable years over the past decades. The determining factor for the profitability of the sector, the margin between polymer products and feedstock prices declined significantly compared to the previous years and reached its deepest point. The key elements of the decline were the low polyolefin prices due to the economic recession. Within polyolefins, HDPE had an especially low price level. The margin reached its lowest point in the last quarter of 2002, when falling polymer prices faced the increased feedstock prices resulted by the Iraqi war tension and Venezuelan strike.

Due to several new investments (recently mainly due to the new PP plant of TVK, the new isocyanates and PVC plants of Borsodchem) the **plastic industry** grew steadily in Hungary since 1993. The volume of plastic processing increased by 26 % in the last 5 years, but this dynamic expansion wasn't sufficient

to fulfil the consumption since local demand increased even more. Increase in demand for plastics should be sustained especially for car components. Consumption of electronics and telecommunications components appeared to decline in the last years. According to the local plastics producers association, Hungarian plastic production reached 565 Kt. in 1H 2002. Per capita consumption of plastic reached 70 kg/year.

The Hungarian plastic industry is very open, thus the share of exports in production is increasing and is close to reach 75%. In spite of this the trade balance of Hungarian plastic industry is in deficit since the 2/3rd of Hungarian consumption is covered from import. The main export-import partners are the EU states.

In the second part of the last decade demand for injection moulded products (components for E + E applications), blow moulded items (PET bottles) and profiles increased, while demand for pipe and foil decreased. Taking into consideration the recent downtrend of the global technology and machinery markets (using mainly injection-moulded products), and the boom in the Hungarian construction industry we expect the market structure to change in a reverse direction.

The companies on the plastic market are mostly private mid sized companies with Hungarian and foreign investors in their ownership structure. **Pannonplast** (Pp) is the largest plastic processing company in Hungary. It is a strategic holding with 17 member companies organised in 4 clusters; has production facilities in Hungary, Romania and Ukraine. Member companies of Pp group manufacture semi-finished and finished products and parts of different equipment primarily for industrial users, mainly from plastic raw materials used in the field of construction and infrastructure, packaging, and assembly of entertainment, informatics and other equipment.

During the last years Pp faced with growing competition in the plastic pipe market, and lower capacity utilisation in the injection-moulding segment. The largest orders came from multinational companies, but HP (2001) and Philips (2002) relocated their production, away from Hungary. In 2002 Pp reached HUF 27 billion total turnover, with a Net Loss of HUF 878 million, because of write-offs and weak sales numbers. Pp is listed on BSE. Due to its poor economic performance the share price has fallen considerably and the company became a take-over target. One of its possible buyer is its rival on the plastic market **Karsai Holding**, having only 1/3 of Panonplast's sales revenue but producing the same operating profit than Panonplast.

1.2.3. Fertilisers

Similarly to several Central European countries, in Hungary, demand for fertilisers dropped substantially with a general decline in the agricultural sector after the political changes. The petrochemical producers TVK and BorsodChem closed their ammonia and nitrogenous fertiliser plants as a consequence of this downturn. The Ipari Robbanoanyaggyár Rt company, manufacturing superphosphates and ammoniated phosphates, went bankrupt and its successor no longer manufactures commodity fertilisers.

There are two operating fertiliser companies in Hungary. Nitrogenmüvek Rt produces ammonium nitrate, CAN, urea and related products. Individual production units are around 2/3rd of the size of European market leaders and reportedly need reinvestment in the medium term. However, the company has been profitable in the recent past and the plant is competitive in cash cost terms. Bige Holding Invest Kft, a privately owned Hungarian company, owns Nitrogenmüvek. The main feedstock (natural gas) is provided from its previous owner, MOL. Tiszamenti Vegyimuvek Rt produces single superphosphate in an average sized plant, but also several other inorganic compounds such as STPP, an important detergent builder. Its plants are quite old. These plants are based on imported phosphate rock and mostly imported gas, which is a disadvantage in ex-works costs. However, domestic producers have a freight

advantage in their local markets. With exports of around 20 percent of revenue, utilisation rates of effective Hungarian capacity are currently high, so there are prospects of sustainable business for the remaining producers.

1.2.4. Downstream Sectors

Downstream sectors include paints and coatings, household chemicals (including detergents), and synthetic fibres.

a. Paints and Coatings

Due to the present low level of consumption per capita in Central Europe growth of paints and coatings markets is expected to exceed of those in the EU. In 2000 average consumption per capita was 9.6kg in Hungary, 2.5 in Romania, 11.2 in the Czech Republic compared to the average consumption of 25kg in Western Europe.

Domestic paint consumption in the last years - in volume - has grown by about 8%. Hungary has consumed more than 120,000 tones of paints of which 80% has been produced domestically. Volume of domestic sales exceeded the HUF 25 billion in 2001. The tendency of growth in water-based paint production has continued in 2002, while the share of solvent-based paint production is decreasing. Based on usage, bulk of turnover comprises of interior, exterior and other building paints, other considerable volumes are sold from industrial paints only. Share of wood industry, corrosion protection paints is minimal.

The largest producers in the industrial and the consumer markets are both owned by foreign strategic investors. Akzo Nobel Coatings Rt, situated on the same site as TVK, is active in wood, coil and plastics coatings, automotive products and printing inks; it leads the industrial coatings market. The leader of the consumer coatings market is Trilak Haering owned 60 percent by Total/Kalon and 40 percent by the coating company Haering. The nominal original capacity of these companies together was 115 000 tons per year but both have engaged in rationalisation and improvement. Based on sales revenue, the Japanese Dainichiseika owned Nicolor is the largest domestic pigment producer. The company producing continuously decreasing sales revenue in the last three years had to face not only the strengthening HUF but also the increasing competition from Far East. Producing 2,600 tone of products in 2002, Nicolor's orders decreased about 25% in the last years. Since 2000, the company was not in a position to invest a significant amount to development and therefore in order to keep its competitive position the company would need about EUR 400 million investment this year.

The international players could be expected to ensure that their Hungarian plants and products comply with EU regulations, environmental requirements and quality requirements.

b. Household Chemicals

The household chemical sector includes various soaps, detergents, and cleaners. Cosmetics and toiletries are typically also included in this structure. The industry sub-sector is subject to strong cost competition across Europe. There are systematic differences in some aspects of the markets between the EU and Central Europe, and Central European producers account for this in their product mix. In Hungary the industry includes companies under both foreign and Hungarian ownership, with detergents dominated by international owners. The Hungarian producers owned by foreign majors appear equipped for a sustainable future.

Henkel Hungary Kft, the 100% subsidiary of chemicals group Henkel Central Eastern Europe recorded revenues of HUF 47.78 billion in 2001 and expected double-digit revenue growth in 2002. Building a liquid detergent plant in Korosladany (eastern Hungary) and logistics centre, the company invested roughly HUF 4 billion in 2001 and 2002 in Hungary.

Table 1.6. Hungarian detergent and cleaning chemical companies

Company	Products	Employees	Ownership
Unilever	Detergents, personal products, industrial clean-errs, foods	1500	Unilever NV
Henkel Hungary*	Detergents, liquid cleaners, adhesives, construction chemicals	700	Henkel NV
EVM (UnitedChemicals)	Industrial and household detergents and cleaners; surfactants and solvents	400	Managers, employees, municipalities
Ferrokemia	Shampoos etc., heavy household cleansers, car care agents and others	120	Hungarian
Majus 1	Shampoos etc., dishwashing detergents, plastic bottles	115	Hungarian

Source: HCIA, European Comission

The Forecast of CEFIC published on petrochimistry.net recently approved regulation in the EU, according which testing on animals is prohibited from 2009 will have a significant impact on the industry. Products from creams to perfumes are tested for their side effects on animals before their distribution, especially to their effect to allergic reactions. Producers need to develop new methods of testing. Restriction is relevant not only for testing but for the import and marketing of products tested with the current method and there is a possibility that EU will have conflicts with the WTO in this regard.

c. Synthetic Fibres

The predominant synthetic fibre producer in Hungary is Zoltek Rt, which is owned by the US company Zoltek. The company has around 30,000 tons of capacity of acrylic fibre spinning, and smaller quantities of polyamide 6 (nylon 6) spinning capacity. Technology includes SNIA of Italy and Du Pont of the United States. Zoltek Rt also produces carbon fibres, which is one of the main specialities of its parent company, and other products such as CMC (carboxymethylcellulose) granules. Resins are imported and around 60 percent of the company's production are exported. Production grew strongly between 1996 and 1998.

In spite of lack of upstream integration and apparent domestic markets, the company appears to be operating successfully. The presence of a relatively sophisticated product in its portfolio - carbon fibre - should underpin its future.

1.2.5. Fine and Performance Chemicals

Hungary has a strong tradition in fine and performance chemicals, including pharmaceuticals.

Agrochemicals - primarily biocides - are a significant part of Hungary's other fine and performance chemicals. As with commodity fertilizers, demand dropped significantly with the decline of agricultural production in the early 1990s. Markets in the former Soviet Union also plummeted. Hungarian production - both production of actives and blending of imported material - dropped by around 40 percent between 1990 and 1998. The Hungarian agrochemical sector exports around 50 percent of its output.

The companies are privatised, with the exception of Nitrokemia. Rhône Poulenc owns the plant on BorsodChem's site, but the other privatised companies appear to be owned by a combination of Hungarian commercial investors, municipalities, and employees.

Table 1.7. Hungarian fine and performance chemical companies

Company	Products	Employees	Revenue (EUR m)	Ownership
Agrokémia	Fungicides, insecticides (own synthesis and formulated)	90	2	Hungarian private
Budapest Chemical Works	Agrochemicals, speciality chemicals	800	21	Mostly privatised: Hungarian
Herberia	Processing of plants for medicinal and other uses	300	7.5	Hungarian private
Nitrokemia 2000	Herbicides, organic chemical intermediates, chloralkali products	750	41	Hungarian private
Reanal	Laboratory reagents, rodenticides	280	8	Hungarian private
Rhone Poulenc Agro Borsod	Biocides and seed treatment	55	12.5	Rhône Poulenc

Source: HCIA, European Comission

Agrochemical products are environmentally sensitive because of their biocide properties and persistence. There are some cases of major historic contamination, and remediation of these is the subject of a major project, which will be partly funded by the government.

II. The impact of EU enlargement on chemical industry

2.1. Legislative impact of Enlargement

2.1.1. The regulation of the European chemical industry

The main areas of chemical industry object of regulation are:

- Market restrictions on dangerous substances and preparations
- Safety Data Sheets
- Good Laboratory Practice (GLP)
- Regulation on fertilizers
- Detergent legislation
- Drug precursors
- Explosives

Market restrictions on dangerous substances and preparations

Most of chemicals are preparations meaning mixtures of chemical substances. They include industrial chemicals, such as solvents and coatings; petrochemicals, such as fuels and lubricants; agricultural chemicals such as pesticides; consumer products, such as detergents and disinfectants, and many others. The majority of these chemicals are of low concern for human health or the environment. These products which are not considered dangerous circulate freely on the European market without any particular rules.

A significant proportion of chemical products has properties that are hazardous to human health and/or the environment. These are classified as dangerous and can circulate freely on EU market only when are packaged and labelled in accordance with EU normative. In order to protect the human health and the environment. Producers and importers have to meet the EU regulations:

- identify and classify chemicals according to their dangers;
- label these chemicals according to strict rules (warnings about the dangers and safety)
- and package them safely.

In a relatively small number of cases the rules for classification, packaging and labelling are insufficient to reduce risks and must be supplemented by rules to restrict marketing and use under the Limitations Directive (*Directive 76/769/EEC*). Substances falling under the Limitations Directive are listed in the Annex I to that Directive which also specifies the restrictions on marketing and use applying in each particular case.

Good Laboratory Practice (GLP)

The principles of Good Laboratory Practice (GLP) define a set of rules and criteria for a quality system concerned with the organisational process and the conditions under which non-clinical health and environmental safety studies are planned, performed, monitored, recorded, archived and reported. The GLP principles have been developed to promote the quality and validity of data generated in the testing of chemicals in order to facilitate their recognition for purposes of assessment and other uses relating to the protection of human health and the environment.

The recognition of test data generated in accordance with the principles of GLP by the authorities in several countries avoids duplicative testing, is beneficial to animal welfare and reduces costs for industry and governments. Moreover, common principles for GLP facilitate the exchange of information and prevent the emergence of non-tariff barriers to trade, while contributing to the protection of human health and environment.

The principles of GLP have been developed in the framework of the OECD. Subsequently a series of further documents on related issues, notably compliance monitoring and inspections, have been established.

Since 1987 the Council has adopted three basic directives and a decision relating to the application of the GLP principles.

- *Council directive 87/18/EEC of 18 December 1987* on the harmonisation of laws, regulations and administrative provisions relating to the application of the principles of good laboratory practice and the verification of their applications for tests on chemicals substances.

- *Council directive 88/320/EEC of 9 June 1988* on the inspection and verification of good laboratory practice (GLP).

- Council decision 89/569/EEC of 28 July 1989 on the acceptance by the European Economic Community of an OECD decision / recommendation on compliance with principles of good laboratory practice.

Regulation on detergents

The EU legislation covers the testing methods of detergents, the content of non-ionic, cationic and amphoteric surfactants. The regulation is prohibiting marketing of detergents where average level of biodegradability is below 90 %.[4] The Commission regulates the labelling of detergents and cleaning products as well *(Commission Recommendation 89/542/EEC*).

In addition to EU laws and standards, national legislation frequently infringes on the type and quantity of raw materials used from consumer protection reasons and environmental considerations.

Phosphates have been either totally or partially banned from detergents in several European countries because of concerns relating to eutrophication of surface waters. In effect this means that phosphate contents vary throughout Europe. In Sweden, for example, phosphates are permitted as the regional water-treatment plants have phosphate precipitation stages. Germany and Italy are phosphate-free. By contrast, in Hungary phosphate-based detergents still constituted for 70% of the market in 1998.

[4] *Directive 73/404/EEC* on the approximation of the laws of the Member States

Directive 73/405/EEC covering anionic (70% market share) surfactants already recognises the unreliability of primary biodegradability tests and establish that these surfactants must degrade by at least 80 %.

Directive 82/242/EEC covering non-ionic surfactants closely parallels the 82/243/EEC in specifying an 80 % pass level and introduced a derogation clause for temporary use of certain surfactants.

Directive 82/243/EEC updated testing methods in 73/405/EEC adding the British "porous" test.

Directive 86/94/EEC extended this clause by but it has expired. It states the BiAS method that is applicable to non-ionic containing 6-30 alkylene oxide (polyglycol) groups.

Drug precursors

In the EU area the manufacturing and placing on the market of certain substances used in the illicit manufacture of narcotic drugs and psychotropic substances is regulated by the Council directive 92/109/EEC of 14 December 1992.

Paints

One of the greatest influences on product development in the coatings industry has been regulatory and public pressure to reduce the emissions of organic solvents to the atmosphere. Volatile Organic Compounds (VOCs) are implicated in the photochemical production of ground level ozone, a health and ecological hazard, and most countries have agreed to reduce VOC emissions. Solvents are one source of VOCs. The Solvents Directive (1999/13/EC) of the EU limits the emissions of solvents from industrial plants such as paint producers or automobile coating operations, and demands careful inventory management. Pollution control techniques are one solution to emission reduction; reformulation of products is another. For consumer products, reformulation is the only answer and has been actively encouraged by regulators in most EU Member States. Environmental labelling schemes have also been employed to help this trend. There has been a consistent shift over several years to water-based or low solvent products, and to dry systems such as powder coatings. Making this shift requires considerable technical development to meet the requirements of, for example, automobile refinishing. The system for coating application often needs to be redesigned as well as the product reformulated. Other environmental issues include the minimisation of possibly hazardous materials, such as some pigments based on heavy metals and some surfactants, and appropriate labelling of the packages. Reduction of wastes during production - especially in condensation reaction processes for in-situ resins manufacture – and during application are also important.

2.1.2. New developments in the European regulation

Overall the EU's chemical regulatory system is based on four most important legal instruments[5]., which cover a broad range of substances of different origins. These instruments regulate the testing of substances and determine risk reduction measures. Furthermore, they establish duties regarding the safety information to be provided to users (labelling, safety data sheets). Beyond these four instruments, specific legislation exists for certain sectors and areas, for example plant protection products or cosmetics or the transport of dangerous goods.

However the current regulatory system is considered adequate for the "new substances"[6], from the regulators point of view the present system must be improved. From this point of view the weakness of the present system is a lack of knowledge about the properties and the uses of "existing substances" on the market[7]. The current number of existing substances marketed in volumes above 1 tonne is estimated

[5] *Council Directive 67/548/EEC* relating to the classification, packaging and labeling of dangerous substances

Directive 88/379/EEC relating to the classification, packaging and labelling of dangerous preparations

Council Regulation (EEC) 793/93 on evaluation and control of risks of existing substances

Directive 76/769/EEC relating to restrictions on the marketing and use of certain dangerous substances and preparations

[6] "new substances" – some 2,700 substances declared to be on the market after September 1981

Testing and assessing their risks to human health and the environment according to Directive 67/548 are required before marketing in volumes above 10 kg. For higher volumes more in-depth testing focussing on long-term and chronic effects has to be provided.

[7] "existing substances" – declared on the market before September 1981.

at 30,000. Some 140 of these substances have been identified as priority substances and are subject to comprehensive risk assessment carried out by Member State authorities.

Furthermore the existing regulation enables more efficient flow of information. The new regulation holds the manufacturers and importers of substances liable to provide information on the products, but not the downstream users (industrial users and formulators).

Liability is usually based on the principle that those who cause damage should pay compensation for that damage. However, in order to be held liable, it is generally required that a causal connection be proven between the cause and the resulting damage. This is often virtually impossible for injured parties if cause and effect occur far apart in time and if adequate test data on the effects of substances are not available. Even if a causal connection can be established, compensations awarded by courts of EU Member States are generally not as high as, for example, in the US, and hence have a limited deterrent effect. In order to improve this situation and to make producers assume responsibility for their products, the Commission has announced its intention to propose Community legislation in this field.

European chemical industry before a legislative boom

There is now a belief, however, that current legislation does not sufficiently limit the risks that chemicals are thought to pose and the last few years have seen various moves to make the legislation more effective. The most important step in this sense taken place when the European Commission has adopted a White Paper setting out the strategy for a future Community Policy for Chemicals[8]. Commission of the European Communities presented the "Strategy for a future Chemicals Policy" in 2001 in Brussels.

The objective is to improve the sustainable development of chemicals in the Community through: the introduction of a single system for the registration, evaluation and authorisation of both existing and new chemicals; making industry responsible for the testing and safety of its products including extension of responsibility for product safety to downstream users; transparency in sharing product risks directly with consumers (via the internet); and ensuring the competitiveness of the EU chemicals industry by also requiring chemical importers to share in testing and to deliver information on the safety of their products.

In order to achieve sustainable development in chemical industry the new chemical strategy declares six guiding principles:

1. **Protection of human health and the environment**
   Elaboration a new control system of Registration, Evaluation and Authorisation of Chemicals (REACH), as a framework of the new chemical policy.
2. **Maintenance and enhancement of the competitiveness of the EU chemical industry**
   The new policy aims to to promote the competitiveness of the chemical industry and encourage innovation, and in particular the development of safer chemicals. In order to maintain competitiveness the commission plans to propose a realistic timetable for submission of data. In the new legislation this is one of the fields that may spark vigorous debate between regulatory and industrial side.
3. **Prevent fragmentation of the internal market**
   The Commission plans to elaborate the new policy on full harmonisation at Community level. This is necessary to reduce the amount of technical barriers within the EU and makes it a lot easier and cheaper for market participants to adapt to new regulations.

[8] A White Paper is traditionally used by the European Commission to launch new policy initiatives. It contains concrete suggestions for the future, where appropriate for changing existing legislation or introducing new legislation. As such, a White Paper creates no legal obligations.

4. **Increased transparency**
   Consumers need access to information on chemicals to enable them to make informed decisions about the substances that they use and enterprises need to understand the regulatory process.
5. **Integration with international efforts**
   The global nature of the chemicals industry and the trans-boundary impact of certain chemical substances have made chemical safety an international issue.
6. **Promotion of non-animal testing**
   Protection of human health and the environment, including wildlife, should be balanced against protection of the welfare of laboratory animals.
7. **Conformity with EU international obligations under the WTO**
   No unnecessary barriers to trade should be created and there must not be discrimination against imported substances and products.

The new system proposes those existing and new substances should in the future, following the phasing in of existing substances until 2012, be subject to the same procedure under a single system. The framework of the new chemical policy is based on a new control system of Registration, Evaluation and Authorisation of Chemicals (REACH). Under this new system, **registration** in a central database - including risk assessments for all intended uses - will be required by manufacturers and importers of all existing substances (some 30,000 substances) and new substances exceeding a production volume of 1 tonne by the end of 2005. Authorities will carry out **evaluation** of the registered information for all substances exceeding a production volume of 100 tonnes (around 5,000 substances corresponding to 15 percent) In case of concern even the substances at lower tonnage will be evaluated. Evaluation includes the development of substance-tailored testing programmes focussing on the effects of long-term exposure and chronic effects. **Authorisation** to continue manufacturing and marketing will be required, at a minimum, for substances that have been classified as a Category 1 or Category 2 carcinogenic, mutagenic or reproductive hazard. This encompasses a number of petroleum substance groups (such as gasoline, gas-oils, heavy fuel oils, aromatic extracts and others).

The Commission proposes to shift responsibility to industry, for generating and assessing data and assessing the risks of the use of the substances. The enterprises should also provide adequate information to downstream users. Downstream users, as well as manufacturers and importers, of chemicals should be responsible for all the aspects of the safety of their products and should provide information on use and exposure for the assessments of chemicals.

An important objective of the new strategy is to encourage the substitution of dangerous by less dangerous substances where suitable alternatives are available. On the other hand should the legislation become too strict then R&D activities from Europe may move to other regions resulting in failure of this objective.

The legislative timeline [9]

- **February 2001**: White Paper published
- 2002: Amendment proposals
- The European Commission is amending and finalising the draft of the proposed chemical policy. The Commission continues to receive information from stakeholders, including the chemical industry, which it can use to update the regulations as it sees fit.
- Fall 2002-Early 2003: Publication of the draft chemicals legislation

[9] CEFIC

- In October, Parliament's environment committee accepted a draft report demanding more stringent regulation and control requirements than those contained in the White Paper. However, these demands do not place further requirements on oil products.

- Industry watchers pinpoint early 2003 as the time when the Commission will publish its draft regulations. It will be the first time that specific details about the chemical policy will be publicly detailed. The draft legislation will almost certainly undergo a series of amendments by the European Parliament and the European Council of Ministers. The two bodies have equal power and are required to come to agreement on the final wording of the legislation.

- 2003: Adoption of new legislation

- European Parliament and European Council of Ministers are expected to agree on the final version of the legislation in the second half of 2003.

- 2004-2014: Legislation is implemented

- The Commission plans to phase in a series of deadlines for complying with the REACH (Registration, Evaluation, and Authorisation of Chemicals) programme between the end of 2004 and 2014.

Conclusion

Regulation on health, safety and the environment has been an integral part of the chemical industry for many years, both at European and international level. From the side of the regulators the risk, by definition, can never be completely eliminated, regulation at least ensures that risks are minimised and kept under control. This may result in a shift to stricter regulation which then may cause damages to the competitiveness of the European chemical industry compared to other regions (i.e. Asia, US), where regulations are softer. This question brings forward the classic tension between environmental issues and short-term industrial interests. The challenge of the regulations is to find the optimal balance between the two sides. From the industry side the requirement (for improved efficiency and hence profitability) is for consistency, simplicity, clarity and (where relevant) speed of decisions and actions.

Sustainable development has a social, economic and environmental dimension therefore the European chemical industry endorses the political objectives set out in the White Paper and accepts its responsibilities in full. In the same time chemical industry's representatives question some of the practicalities of the chemical policy review. Firstly the industry is concerned that greater bureaucracy will mean more testing on more chemicals and will slow down the risk-assessment process. An answer on this problem could be a streamlined testing programme (taking into consideration animal protection) that focuses first of all on chemicals of greatest concern. The industry needs a faster registration procedure for new substances so as not to inhibit innovation, and believe that downstream users should be more involved in the management of chemicals.

The White Paper has suggested that total cost of testing and administration of substances under REACH system may reach Euro 2.1 billion by 2012 while other industry linked sources have suggested that amounts could skyrocket to Euro 7-8 billion (about Euro 700-800 million per annum for the industry). Comparing to the total turnover of the chemical industry (roughly EUR 450 billion) this amount seems to be low, but if we take in consideration the distribution of the cost, the effect couldn't be considered negligible.

The larger part (more than 80%) of this amount probably will be carried by roughly 20% of industry. Nonetheless, companies most affected will likely be the small-mid sized fine and speciality chemical suppliers who potentially could see entire profits wiped out as a result of the additional testing costs.

This could have a knock-on effect on these companies' customers, possibly pushing chemical suppliers to manufacture outside the European Union. The overall extent of potential damage to the European industry, is however, still unclear - first, because there is expected to be similar testing and product safety constraints imposed on importers of products from outside the European Community; and secondly – because there will be an increasing onus on both manufacturers of chemical products as well as downstream formulators to find environmentally-friendly, healthy products to replace currently hazardous chemicals.

In many cases, the increased costs are caused by the proposed inclusion of substances that do not enter the public domain. This is the case of intermediates, many of which never leave single sites or are shipped between sites under well-controlled circumstances. Industry can demonstrate that its existing performance under occupational health and safety legislation and transport legislation protects its employees and distribution partners. In this instance REACH provides no additional benefit.

REACH does however add to costs because it covers each step in the production process so that importing the more advanced intermediate into the EU becomes a more attractive option. This promotes relocation of production outside the EU. At the same time, exports of intermediates to the world market will diminish, thereby negatively influencing the trade balance. Toll and contract manufacturing companies will be hardest hit.

These cost implications are of particular concern for example to the manufacturers of active pharmaceutical ingredients as the synthesis chain to produce an active ingredient is sometimes composed of up to 20 intermediate steps. This sector is made up of hundreds of companies, located throughout the EU. The sector employs around 40,000 people and the EU leads the world in terms of sales, followed by China and India, with its main export market being the USA. Competition is intense and margins are already under severe pressure with little opportunity to pass on cost increases to customers facing similar competitive pressures.

Chemical trade flows from and to the European Union will fundamentally alter as a consequence of REACH. Sourcing of certain chemicals may switch to outside the EU, while in other cases exports to third countries may decrease. In the EU, downstream users are unlikely to pass on the higher production costs to their customers, as WTO rules limit the possibility of preventing the import of cheaper articles manufactured outside the EU with substances not subject to a REACH-type system. Relocation of article manufacturing to outside the EU will also be encouraged by REACH.

2.1.3. Implementation of EU's regulation

Candidating for EU accession, is requiring ensuring that their national legislation is harmonised with that of the EU. Many aspects of legislation, such as protection of intellectual property rights, are common to all industries. The legislation that is most specific to the chemical industry and has the greatest potential economic impact covers the following topics:

- Pollution from Plants
- Waste Management
- Major Accidents
- Worker Safety
- Other regulation

Pollution from Plants

EU directives include several that define limits to atmospheric emissions and aqueous effluent from process plants. These cover emissions from combustion plant, for example, and effluents, which contain substances of specific environmental concern such as heavy metals and chlorinated organics. Directives aimed at specific industry segments, such as titanium dioxide producers and choralkali plants, are also in place. The IPPC (*Integrated Pollution Prevention and Control*)[10] has a broad significance for the industry. It requires Member States to implement proper processes of authorisation and monitoring of compliance, and it mandates the use of BAT (Best Available Technology).

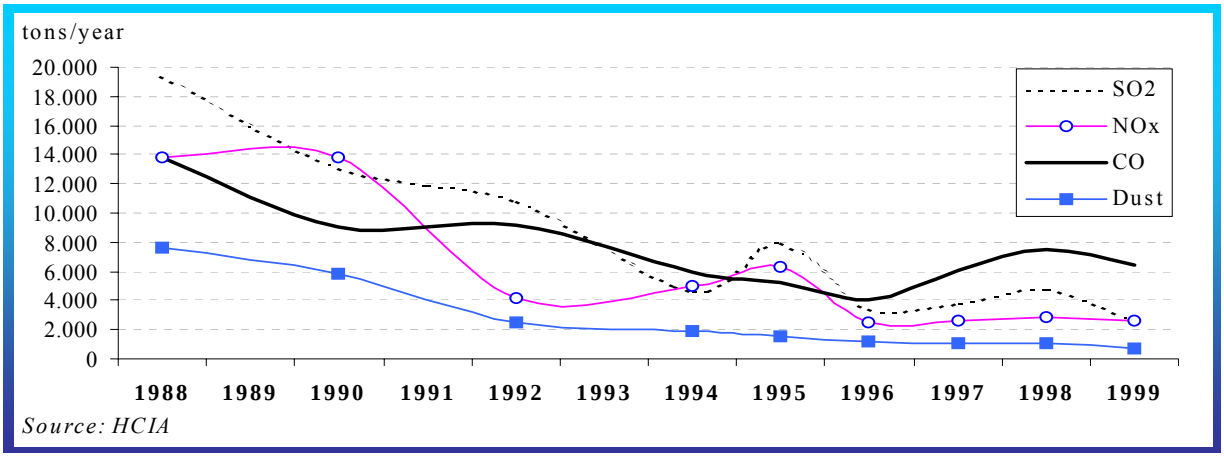
Like other Central European countries, Hungary's legacy system of environmental legislation was founded in Russian law. In practice, this was less stringent than current EU legislation, such as the requirement for BAT (Best Available Technology) embodied in the IPPC directive.

Hungary started to introduce standards based on those in the EU at the beginning of the 1990s. The formal legislation does not necessarily comply with that of the EU in all respects, but that companies have in any case made progress in adopting appropriate control techniques. Knowledge of good practice has often benefited from contacts with EU producers directly and through the industry association CEFIC.

Hungary has made progress in environmental legislation in terms of controlling pollution from combustion plants and industrial plants. Measures were taken at major producers to comply with EU environmental standards (for example to reduce emissions (mercury or sulphur emissions) or to limit evaporative losses from hydrocarbon storage tanks).

A proposed amendment to the law regulating environmental fees in Hungary caused confusion in the chemical industry in the end of last year since it could have serious effect on several large chemical firms. The goal of the amendment is to cut down on emissions that pollute the air. The amendment seeks to expand the fee requirement to be paid on paint thinners and solvents to include all kinds of thinners and solvents. Several products used in the chemical and pharmaceutical industries fit this description. The new regulation could have necessitated the firms' paying a HUF 200 per kilogram fee, which would have very seriously affected the profitability of these firms and raise the price of many products. However these firms, since they use these products in a closed system, do not affect the environment, and therefore are not be obliged to pay the fee.

Figure 2.1. Volumes emitted by chemical industry



[10] Directive 96/61/EC

Waste Management

The chemical industry is affected both by more stringent specifications applying to its own disposal units, such as hazardous waste incinerators, and by the conditions placed on external disposal. In particular, if a country does not have access to suitable merchant chemical waste disposal facilities, a significant cost and administrative burden could be placed on the chemical producers and on industrial users of certain types of chemical products. Some Central European producers currently need to transport waste outside their country for treatment.

Hungary made substantial improvement regarding to on-site hazardous waste incineration and remediation of historic contamination. Merchant waste incineration capacity is available in Hungary, however, the national framework for waste management will require more actions. The most important piece of legislation that has still not been adopted is the National Waste Management Plan (NWMP).

For the larger companies at least, the chemical industry is already making substantial progress in environmental controls. Some are familiar with EU practice through participation in European industry associations. Environmental expenditure may accelerate when Hungary joins the EU but this is likely to be an evolutionary change.

Remediation or containment of known past pollution of soil or groundwater is also a need on several plants, although it is often a response to general environmental considerations rather than specifically to EU quality standards. Capital expenditure to bring plants up to EU standards and good practice is typically a relatively high transient burden followed by continuing spending at a lower level over the life of the plant. In many cases those responsible have long gone out of business or are unable to finance the clean up. Then it is either up to the local authorities or the state to clean up the sites.

Major Accidents

Large chemical plants are among those in which there is the potential for major accidents, whether by release of toxic material or by explosion. The Seveso II Directive (96/82/EC) addresses the issue by requiring formal identification of hazards and minimisation of risk, for example by system design or safe location of possible sources of danger. Some companies in the EU have engaged in serious expenditure to resite bulk storage or control rooms as a consequence.

Hungarian companies typically have well-developed contingency plans and appropriate links with emergency services. Some of the larger sites have well spaced layouts compared to those in the EU. An emphasis on civil defence in the Comecon era was one of the influences to encourage this. However, it is probable that some companies at least could face investment requirements if they applied the same risk assessment standards as used in the EU.

Worker Safety

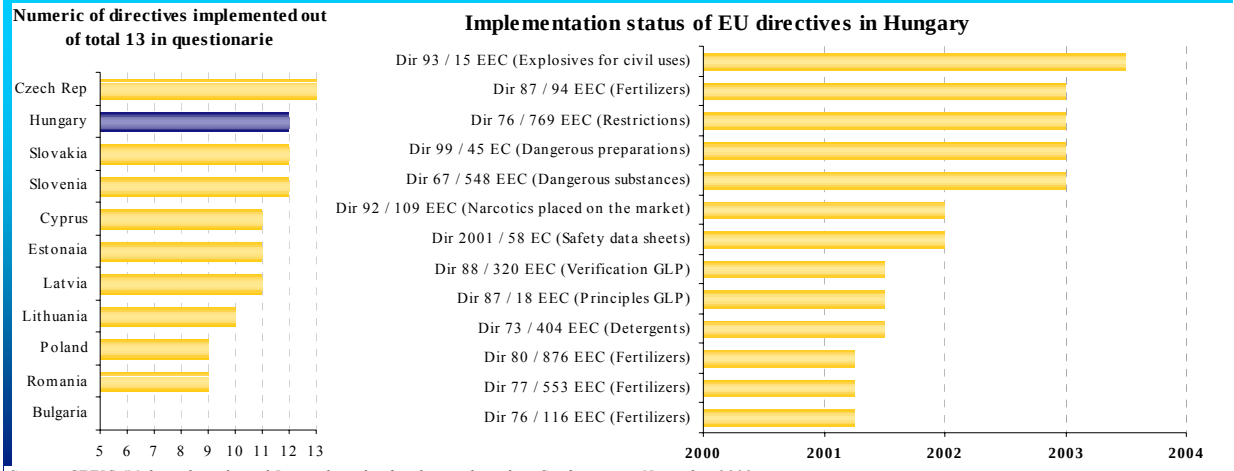
Worker safety issues of particular relevance to the chemical industry are those relating to potentially hazardous chemicals, such as training in safe handling, and monitoring and control of exposure of workers. Larger Hungarian companies usually have internal training, which addresses the question of safe handling. Progress has been slow within the EU on agreeing standards for concentrations of chemicals in the workplace atmosphere. Plants usually have some form of emergency facilities such as showers, and conduct appropriate medical checks.

However, the standards of worker safety, include normal mechanical accident prevention, do vary widely. Even on simple issues such as wearing of protective clothing, there can be a major difference be-

tween EU producers and Hungarian plants. Improvements in management processes and investment in equipment is likely to be needed, but cost implications should not be dramatic.

Hungarian chemical companies generally meet the EU requirements, and the Hungarian legislation affecting the chemical industry made more progress than the implementation of other general issues. Hungary practically implemented the "aquises"[11] regarding to chemical industry in its own legislation being in this point of view leader in the region. According to the last country report[12] *"Significant progress was also made in the area of environment, notably through the adoption of legislation on Environmental Impact Assessment, on water, waste, industrial pollution control and risk management, on chemicals and on radiation protection. The administrative capacity in this sector was also improved, but needs further strengthening, in particular as regards the clear distribution of tasks between the ministries involved".*

Figure 2.2. Implementation status of EU directives



Source: CEFIC (Making the enlarged Internal market for chemicals reality, Conference on November 2002

A large part of the sector-specific *acquis* is also in place. With regard to the *New Approach Directives*, work remains to be done on construction products, civil explosives, in vitro diagnostic medical devices and cableway installations. The outstanding legislative issues under the *Old Approach* relate mainly to metrology, where an impact analysis has been carried out in relation to legislation aimed at harmonising with the *acquis*; transparency of pricing of pharmaceuticals for human use; and the *acquis* on chemicals.

[11] Directive 67 / 548 EEC on Classification Packing Labelling of dangerous substances

Directive 99 / 45 EC on Classification Packing Labelling of dangerous preparations

Directive 76 / 769 EEC on Restrictions

Directive 2001 / 58 EC on Safety data sheets

Directive 73 / 404 EEC on Detergents

Directive 76 / 116 EEC on Fertilizers

Directive 77 / 553 EEC on Fertilizers

Directive 80 / 876 EEC on Fertilizers

Directive 87 / 94 EEC on Fertilizers

Directive 92 / 109 EEC on Narcotics placed on the market

Directive 93 / 15 EEC on Explosives for civil uses

Directive 87 / 18 EEC on Principles GLP

Directive 88 / 320 EEC on Verification GLP

[12] 2002 Regular Report on Hungary's progress towards Accession

In order to help accession of Eastern European countries and to the incorporation of EU legislation in their national laws European Chemical Industry Council (Cefic) opened its membership to Central European Federations from the year 1992. Today, the Chemical Industry Federations of the Czech Republic, Hungary, Poland, Slovakia, Slovenia and Turkey are full members of Cefic and the Federations of Bulgaria, Estonia and Lithuania are Associate Members of Cefic. Cefic is preparing to develop assistance to member companies and launch new programs in the future focusing on the issues of chemical legislation, protection of human health and the environment, chemical transport, social policy and employment, economic statistics and benchmarking

2.2. Economic impact of EU enlargement

Hungary is one of the most successful Central European transition economies. Privatisation is well advanced with a high proportion of foreign investments. The chemical industry is one of the Hungarian economy's determinant sectors. In those subsections where the chemical industry has been able to retain its export orientation in the last decade (especially in intermediate pharmaceutical products, plastics and agrochemicals) the accession could not cause any problems. Considering the chemical industry's large feedstock need and Hungary's weak feedstock supply, some other subsections could face further need for adaptation.

There is a strong **petrochemical and polymer sector**, which is a success story in regional and national context as well. This sub-sector is the largest in the Hungarian chemical industry and it has potential for further expansion. Rationalisation has been undertaken in most industrial segments, with the closure of some units and restructuring of the existing capacities. The remaining production plants appear to be broadly competitive, but with a need for further investment. The **downstream sectors** - paints, detergents, and fibres - are also relatively strong with a dominant presence of foreign strategic investors. In these sectors decisions relating to the future are in the hand of foreign investors who had partially restructured and integrated the Hungarian companies following the privatisation and at the same time prepared them for the EU accession. Hungary has a strong tradition in the **fine chemicals** and pharma business. The fine chemical companies are largely privatised dominantly by Hungarian investors and some of these companies need further restructuring and environmental expenditures.

2.3.1. Competitiveness of Hungarian chemical industry

In terms of competitiveness the **cost of production** is a key factor of success. Important elements of this include type and price of feedstock, size and modernity of plant, and the fixed cost base. The cost position of the Hungarian chemical industry varies between specific plants. Typically, however, fixed costs are low and compensate to a large extent for disadvantages in materials costs and plant characteristics. In the following section we try to give an overview of the factors determining competitiveness.

Feedstock availability and price is a prime factor

Hungary relies heavily on Russia for oil and gas and is landlocked. Hungary imports more than 6/7 of its oil and 4/5 of its natural gas needs, domestic output is diminishing in significance. Transport is done through a network of pipelines that has been built up during the soviet era and modernised since then. The dependence on feedstock is a main feature of the EU as well. EU imports hydrocarbon feedstock through port cities such as Antwerp or Rotterdam which is a significant drawback compared to regions such as the Arabian Gulf. Hungary's accession to the European Union will probably not affect this factor of competitiveness.

Capacities, economies of scale, technology and integration

Processing plants are competitive when they have large capacities (so can take advantage of the economies of scale) and use the latest technology. This factor is the most important in the petrochemical industry.

At the end of 2001, there were 50 steam crackers operating in Western Europe and 9 in Central and Eastern Europe, with annual ethylene capacities of 22,166 Kt. and 2,240 Kt. respectively, totalling 24,451 Kt. Eastern European ethylene capacities account for only 9% of total European capacities. The capacity of Hungarian and Slovakian ethylene plants –both owned by MOL- is the largest of the Eastern Euro-

pean region, however current Hungarian capacities could not be considered competitive compared with the European capacities.

Table2.1. Petrochemical capacities in the Central and Eastern European region

Location	Operator	Existent capacity in 2001	Planed capacity by 2005
		Kt ethylene/year	
AUSTRIA			
Schwechat	OMV	345	n.a.
BULGARIA			
Burgas	Neftochim	300	700*
Burgas	Neftochim	150	
CROATIA			
Zagreb	INA	70	n.a.
CZECH Republic			
Litvinov	Chemopetrol	485	560
HUNGARY			
Tiszaujvaros	TVK	360	610
POLAND			
Plock	Polski Koncern Naftowy ORLEN	360	660
ROMANIA			
Pitesti	Arpechim	200	n.a.
SLOVAKIA			
Bratislava	Slovnaft	200	200
YUGOSLAVIA			
Pancevo	Chemi Industria	200	n.a.
Total Central and Eastern region		**2,240**	**3,700***
Total EU		**22,166**	**22,200***

Source: MOL / CEFIC / APPE / PMRC *IEB estimate

In line with the growth prospects of the regional markets there are plans for several capacity expansions in the region. TVK's and Slovnaft's combined ethylene capacity is being raised from 560 Kt./year to 810 Kt./year. Other planned expansions are for HDPE at TVK and polypropylene at Slovnaft. With these improvements the aggregate plastics capacity of the companies owned by MOL will reach 1.25 million tons by 2005, thus becoming one of the eight largest bulk polymer producer in Europe. This could make MOL, the leading regional oil and petrochemical company more competitive on the European market. Other significant improvement will be accomplished by Borsodchem, the company doubling its PVC, VCM and MDI capacity.

Most of Hungarian petrochemical capacities are modern facilities, however the legacy in some cases is of plants using older technology. Capacity extension programs improve the technology level as well, thus the Hungarian capacities will become more competitive in EU.

Important factor to downstream production units, such as polymer plants is the **integration** of the industry. If upstream and downstream plants have common ownership, the total margin can be shared between the plants. This improves the ability to compete at the bottom of the business cycle. In addition to integration in terms of ownership, linkages within the industry are also important. Connection by pipeline, such as for ethylene, is one aspect of integration; geographical proximity of several plants with technical synergy is another. In the sense of the integration Hungary represented by MOL plays significant role in the region.

Energy costs

Utility costs are largely dependent on fuel prices. However, the energy sector is still not fully privatised and liberalised in Hungary (as well as in some other CEE countries). Domestic consumers are often favoured with cheaper tariffs than large industrial consumers are. The situation is quite the opposite in the EU. Liberalisation of the energy sector is currently under way in the EU and will be required in Central European countries joining the EU.

The Hungarian Energy market is in the **first phase of liberalisation**, allowing the largest electricity consumers to freely choose the electricity supplier and a part of consumption can be covered by import. The largest Hungarian chemical companies producing the bulk of Hungarian chemical production are between the top energy consumers in country allowed to enter the free energy market. This will probably result in a reduction of energy costs. The current state of the Hungarian energy liberalisation lags behind the EU liberalisation, therefore reduction in energy costs will take some time and will only improve competitiveness in the medium run. Nevertheless some advantages can be derived for Hungarian energy consumers from the access to the Ukrainian energy market, which is far the cheapest energy market within the region.

On the western markets, liberalisation has brought price reductions of about 10-20%, but observers generally believe that prices will fall only slightly in Hungary. The extent of price decreases will depend on the availability of imports, since "a large portion of Hungary's power supply is not competitive, with a high cost base at domestic power plants."[13] According to Hungary's largest power consumer BorsodChem, the liberalisation of electricity market should bring a 30% drop in prices. BorsodChem expects to pay about 3 eurocents per kWh for power, on par with its western competitors down from the current cost of about 4 eurocents.

Labour costs and productivity

Table 2.2 Split of employees between sub-sectors Hungarian chemical industry 2001

	blue collar	white collar	Total	Structure
Oil-processing	**6,787**	**4,689**	**11,476**	**15%**
Rubber	6,249	1,520	7 769	10%
Plastic	20,514	4,990	25 504	32%
Rubber and plastic products	**26,763**	**6,510**	**33,273**	**42%**
Petrochemical, base, materials	7,547	4,634	12 181	15%
Agricultural, chemical, products	419	224	643	1%
Paints, coatings	973	648	1 621	2%
Medical, and pharmaceutical products	1,392	872	2 264	3%
Soaps, detergents,and cosmetics	2,365	1,520	3 885	5%
Other, chemical products	5,149	3,264	8 413	11%
Fibres	848	327	1 176	1%
Chemical materials and products	**20,296**	**13,959**	**34,255**	**43%**
Chemical industry total*	**53,846**	**25,158**	**79,004**	**100%**

**without pharmaceuticals*
Source: Hungarian Chemical Industry Association

Labour costs and productivity is the main determinants of fixed costs. Although significant layoffs took place in the past decade the overall picture is still of low wages and low production per employee com-

[13] Laszló F Kovács, BorsodChem CEO said in an interview made by Reuters

pared to the EU. The level of sales per employee is less than 1/3rd of the EU level and somewhat lower even than the other CEE countries.

If productivity is to be increased, capital expenditure is often needed, such as on automation of warehousing or of laboratory analysis, or on advanced process control systems on plants. Rationalisation of site layout, such as reduction in numbers of control rooms, may be needed. This suggests that it is not always appropriate to demand EU staffing levels; the saving may not justify the capital expenditure, due to lower labour costs. However, there are also many instances in which employee numbers reflect a previous political commitment to full employment. Some streamlining is therefore often feasible and is desirable to improve the company's position and to prepare for a long-term rise in real wage levels. In the past big companies have introduced large scale rationalisation programs, to improve efficiency, but due to the expensive nature of layoffs and introduction of new technologies these steps only pay off in the long run.

Technical quality of the product can be used as a differentiator in the marketplace, even for some bulk products such as thermoplastics as well as for specialities and consumer products. This implies a strong capability in applications development and technical service plus possibly, depending on the company's strategic positioning, basic R&D. Currently these activities are concentrated in Western European countries however in Hungary companies employ highly qualified people with lower costs, and established links with technical institutes. This means that the enlargement in the long run could result in increasing R&D activities. Hungarian chemical industry is strongly concentrated on commodity chemicals, thus the technical quality does not affect significantly the competitiveness of the industry.

In terms of delivered cost, **supply chain factors** are important to competitiveness. These include costs of packing and handling, freight and other distribution costs, and tariffs. Producers obviously have an advantage in their domestic markets and a disadvantage on export.

Hungary has an EU accession agreement in place, under the terms of which import tariffs on industrial goods are either zero or fast reducing to zero.

Very large producers, particularly those with a regional or global presence, can establish sales and supply chain networks to give appropriate service levels in terms of delivery time and service. Streamlined business processes, typically supported by IT systems, are used to improve order taking and processing; further enhancement is possible through e-business. Central European producers typically do not have the scale of business and the commercial management infrastructure to offer an exactly equivalent level of service, though some are making substantial progress. Some producers find it difficult to obtain top prices when exporting to the EU even when the product quality is good, because of customer perceptions of reliability of supply and level of technical support.

3.3.2. Competitiveness in the main industry segments

a. Petrochemicals

The majority of ethylene production in Europe is based on naphtha while in other geographical regions, such as the Middle East and the US, efficient gas cracking is more prevalent, giving these regions a significant cost advantage over the European industry. Producers in the Middle East also have access to gas feedstock at advantageous prices, giving them a further cost advantage. The European industry is further disadvantaged by the structure of its production base, which is fragmented by global standards. A significant structural change in plant scale has been realised in Western Europe, with the average production capability of an ethylene line having risen from around 290 Kt. to 400 Kt. However, the industry view is that further consolidation will have to take place if the industry is to remain viable on a

global basis. New plants in the western world are now being built with nameplate capacity typically of 600 000 tons to 700 000 tons or more in a single train. From this point of view new Hungarian capacity (800 Kt. owned by MOL) would be competitive in European and even in global terms.

Over the years, the technology associated with ethylene production has improved -both in terms of the yield pattern from the cracker and the energy used to produce a ton of ethylene. Retrofitting an existing unit to meet state of the art production technology would require a substantial capital input, however, and in most cases the economics would not be favourable. It follows therefore, that older crackers will tend to have a higher variable cost structure than more recently built facilities.

The TVK cracker in Hungary is a relatively efficiently run unit, which allows it to compensate for its other cost disadvantages. Fixed costs represent less than roughly 20% of ethylene cash cost of production, so Hungary gains little as a result of its lower labour costs. Conversely, the generally small scale of production and low operating rates constitute less of a penalty than in other sectors of the chemical industry.

Hungarian net feedstock cost is somewhat higher than for Western European operators. Overall, therefore, a key issue faced by the Hungarian ethylene industry is access to naphtha feedstock at prices, which will allow it to compete effectively with integrated EU producers that are not supply-constrained. With the region projected to remain in overall naphtha deficit, this is likely to remain a significant barrier to improving the cost structure in the future.

b. Polymers

The commodity polymers sector is by far the largest outlet for the basic petrochemicals. The sector comprises four major polymer groups: polyethylene, polypropylene, polyvinyl chloride (PVC) and polystyrene. The polyethylene sector is commonly segmented into three further product groupings, reflecting different processing and performance properties of the polymers produced. These are LDPE (low-density polyethylene), LLDPE (linear low-density polyethylene) and HDPE (high-density polyethylene).

Hungary has three commodity polymer producers. TVK produces polyolefins on a site integrated with the steam cracker and supplies ethylene to BorsodChem for the manufacture of PVC. Dunastyr is the country's only polystyrene producer. The plastics processing industry is in general fairly well advanced, with multinationals becoming involved in the Central European business via the entry to Hungary. TVK itself has significant conversion capacity. In Hungary production and use of PVC has increased as construction output picked up although the use of PVC is likely to decrease as environmental issues come into the spotlight after May, 2004.

Competition is also likely to increase as some polymers plants which are being planned or are under construction will reach the larger scale than those in the Western European region have. Further, many of these producers, particularly in the Middle East region, will have access to low cost hydrocarbons and will be able to produce the raw materials, ethylene and propylene, at a much lower cost than those in Western Europe. These plants, with the advantages of economies of scale and cheap feedstock, will put increasing pressure on the European market. Although by then Hungary will be within the trade barriers of the EU, TVK should be prepared to be more cost efficient than its western counterparts. Over the next five years Europe, currently a small exporter of total polyolefins, is forecasted to become a net importer.

c. Fertilizers

In Hungary, production is likewise dominated by the nitrogen based product group, with ammonium nitrate and its derivative calcium ammonium nitrate as the key product groups, accounting for over half of fertilizer production tonnage. After 1989 fertilizer consumption fell radically as a result of the disintegration of the centrally planned economy and further decrease or at best stagnation after the accession is possible. Population is slowly decreasing and the only change may come from agricultural subsidies, which may help boost production and fertilizer usage temporarily.

After 2004 Hungary will also participate in the EU's Common Agricultural Policy CAP. According to the agreement Hungarian agricultural producers will benefit gradually from subsidies. Better profitability of the agricultural sector may act as a mild catalyst of fertilizer demand in the medium term, however in the long run subsidies are projected to be laid off significantly.

The competitiveness of fertilizer industry is depending on raw material prices and for nitrogen based fertilizers, the primary feedstock is ammonia, which is itself manufactured from natural gas. Gas cost is a key component in the cost of production of ammonia, representing around 75 percent of its cash cost of production. From this point of view Hungary has a stronger competitive situation due to relatively cheap Russian gas import.

Ammonium nitrate is a low cost, low value product, and consequently, freight costs represent a high proportion of the delivery cost. Because of this, the material is rarely transported over long distances. Hungary exports around half of its fertilizer output, but primarily to neighbouring countries, and it is highly unlikely that a Western European producer could compete on a cost basis in Hungary.

Fibres

In Hungary parallel with a domestic sale decline as well, the exports increase. Around two thirds of total output is exported.

The key driving force in the Hungarian industry is related to the need to minimise costs because in the textiles sector, European and increasingly Hungarian producers must compete with imports from low cost producing regions, in particular in Asia. Currently low labour costs and low transportation costs helped Hungarian producers gain market share in the Western European markets. However the production of fibres and especially textiles is labour intensive making it difficult for Hungarian producers in the long run to compete with those with a low cost labour pool.

Detergents

Big players like P&G, Unilever, Henkel, Colgate is clearly targeting Central and Eastern Europe as a major growth area. Hungary represents an opportunity to enter a growing market. Currently the per capita consumption in Western Europe is around 16 kg per capita while in Hungary it is about 9 kg per capita. The strategy has been to take over local facilities and introduce Western practices into this consumer oriented business. There has been significant investment and efforts to harmonise with EU norms and legislation. This reduces the challenges of the Hungarian industry that EU membership will entail. Low labour rates and a technically skilled workforce are further attractions to investment.

In Hungary there is still local competition which is limited in size and know-how in terms of financial ability to adopt to EU legislation and norms both now and in the future. Producers plan their supply chain on a regional basis. For example, Henkel in Austria exports products to the region to satisfy local demand for high quality powders.

In Hungary traditional powders are still dominant. This reflects a different washing machine type (the semi-automatic agitator type), a custom of pre-soaking in blend and also handwashing. Phosphatic builders are still used in Hungary but limits to phosphate in detergents are likely to be imposed. Chlorinated bleaches are used in cleaning and disinfectant products are common in detergents. Some of the international companies wish to move consumers to more modern - and higher added value - products. Washing machine ownership, an indicator of the potential of the detergents market, is strong in Hungary it is above 90%. However a high proportion of washing machines are outdated, indicating that as households switch to more modern equipment, they will not only consume more detergents but also more sophisticated and expensive products. In Hungary only half of households have automatic washing machines. Although Hungary is moving to EU regulations, there can be difficulties in implementation. Manufacturers in the EU can demonstrate compliance with requirements of biodegradability of surfactants by presenting documents. Consumer groups police this. By contrast Hungarian regulators want to demonstrate biodegradability by testing - providing work for the technical institutes in each country.

The production technology has changed in recent years in order to reduce the consume of energy and water per ton of product. It also allows the use of ingredients such as percarbonate and enzymes, which permit lower temperature washes and have a reduced environmental impact. This technique is used in Hungary by the majors and could add significant cost pressures to indigenous suppliers. A number of the key cost ingredients such as enzymes, and bleaching agents and activators are imported in Hungary. However several ingredients such as surfactants and builders are available. Manpower costs in Hungary are still low enough to more than compensate for increased manning in the region. Product quality and marketing channels are important factors in this business as well as production costs.

2.3.3. Market structure

Although the privatisation in the Hungarian chemical sector has already passed off, privatisation in the region is still in proceeding on. In terms of changes in the market structure the accession to the European -Union is an important impelling power since the final goal behind acquisitions in the region is gaining market share in accession countries. At the same time the forecoming accession has geared the efforts for regional concentration and therefore this effect has already threw out in the market structure. It still remains a question what kind of structural changes could be expected from the current situation, however, it also has to be noted that changes could only partially be charged to the EU accession.

Vertical integration

The wave of mergers and acquisitions in the new European chemical industry could also be experienced in Central Europe resulting in the acceleration of vertical and horizontal integration (especially in the oil and petrochemical industry). The main factors accelerating the vertical integration, which drives petrochemicals companies closer to local oil firms, are the needs to secure feedstock supply and to obtain competitive production capacity. Oil companies in the region are also looking to expand through increasing supply revenues and diversifying production. As a result of this process Central Europe is also heading to an industrial structure already existing in the EU, characterised by strong ownership interpenetration between companies producing different elements of the chemical product chain.

MOL, the Hungarian oil monopoly acquiring the majority stake in TVK, took the first step in the vertical integration of the Hungarian petrochemical industry. Wilful appearance of the Russian investors has speeded MOL in the acquisition of TVK, therefore obtaining a controlling stake has been preceded by a strong purchasing competition won by MOL. However, a significant part of TVK' shares (roughly 40-45%) is currently owned by Russian linked investors. The Hungarian oil company has integrated TVK in its chemical division.

Horizontal integration

The horizontal integration is characteristic mainly to the oil industry, but (due to the vertical integration) the petrochemicals are also affected. The main reason for regional expansion derives from the optimal usage of capacities. Another factor accelerating this process is the EU enlargement, the regional companies tending to enforce their market position on this market, which will become soon part of the EU. In addition, privatisation of oil and chemical companies is currently undergoing in Central European countries, allowing for horizontal integration. Leading participants of the regional integration:

- the already mentioned MOL,
- OMV - capturing an increasing market share in the region's oil industry
- Russian linked entities, capitalising their own optimal financial position they consider the Central European region as a door-step for entering the EU markets

MOL has carried out the first step in the regional expansion through the acquisition of a 36.8% stake in Slovakian oil and gas company **Slovnaft**, which is also involved in the petrochemical business. MOL has recently signed an agreement with Slovnaft on doubling its stake resulting in 67.8% share in Slovnaft. MOL is currently participating in the privatisation of Croatian oil monopoly **INA** and also plans to praticipate in a new tender for the privatisation of the state stake in the Czech petrochemical holding company **Unipetrol.**

In line with the acquisition, integration and expansion of Slovnaft in Slovakia and investment in TVK, **MOL** aims to become the largest ethylene producer in Central and Eastern Europe by 2005. MOL plans to invest more than US$ 2 billion in oil production, sales and petrochemical production in the period of 2003-2005. Starting from 2005 the company plans to double its oil exploitation compared to the current level. MOL will invest USD 500 million in petrochemicals over the next three years to expand its presence in Central and Eastern European markets. The majority of the investment will serve expansion of ethylene and bulk polymer capacity at TVK in Hungary and Slovnaft in Slovakia. The projected investments are based on the expected growth of the petrochemical market in the region. MOL forecasts 7% growth in the sales of polymers in the region.

MOL does not exclude the possibility of other major acquisitions within Central Europe. Potential acquisitions include stakes in PKN Orlen of Poland and the above mentioned Unipetrol of the Czech Republic. Besides MOL, other regional players in petrochemical industry are Lukoil, PKN and Chemopetrol.

MOL's main competitor, OMV after a period of hesitation has mastered its strategy and has achieved a strong market position in the region. Their main objective is to gain as large as possible market share on the fuel market, which turned to be a resultful strategy. Following its latest acquisition (purchased the 313 Aral fuel stationed, previously owned by BP) with its 1,650 fuel stations the company took over leadership in the region. Besides its retail market positions, OMV has gained significant strategic positions through the acquisition of Preusag Energie (formerly TUI's oil and gas exploitation subsidiary), purchase of Rompetrol's 25.1% and MOL's 10%.

Russian firms are eager to expand their vast supplies to Central European petrochemicals suppliers, taking advantage of their geographical location and traditional co-operation based on the links with the Friendship oil pipeline. Recently, Russian oil and gas companies have been expanding their business to petrochemicals and are to become strong competitors in the European market. Through its petrochemical subsidiary Sibur, Gazprom, the Russian gas giant, has already started to establish a presence in Hungary (having a control stake in BorsodChem and having stake in TVK). Lukoil could take over Sibur's (reorganised in the meanwhile) position in the region, whose management is increasingly interested in Western European expansion, through Central Europe. Lukoil, the largest Russian oil company

has already stepped in to the regional petrochemicals and oil sectors. The company has already got a significant share in the petrochemical unit of Nyeftohim, located in the Bulgarian Burgasz, as well as in refineries based in the Romanian Pitesti and Ukraine (Oriana). At the same time we could experience strong Russian presence in the Polish, Croatian and Czech privatisation.

The Russian interest for the Central European oil industry derives from logistic considerations. In one hand the Central European region with its logistic base could play the role of anteroom for the European market. In the other hand the USA is currently seeking for the alternative sources of Middle East based oil and as such the Russian import have been raised to be a solution. This is currently limited by the lack of transportation capacities and it has been raised as a solution the establishment of the Friendship oil pipeline, crossing also Hungary. Subject aim could significantly revalue the importance of the Hungarian chemical infrastructure in the region.

Possible future developments in the market structure

Central European countries preparing for the EU accession have already been experiencing the effects of Western European market factors, however, there have been no significant acquisitions or fusions yet from the western part. Contrary to their Eastern European peers, the Western European investors show their willingness in the regional privatisation to a much lesser extent. This could be explained by the fact that these entities facing the shrinkage of their own market, need new markets rather than processing capacities. Western European companies showing a disinterest in terms of acquisitions are active participants and have serious market share in the downstream segments. We could draw the conclusion that these companies won't participate in the current competition for the capacities (small and low technology by European standards). On the other hand there are promising investment prospects in the Middle East, that proved to be more economical.

Relative disinterest of Western European participants on the other hand gives an opportunity for Central Eastern European market participants for the establishment of their own multinational companies. Aim could be the forming of such organisations that could merge with feedstock suppliers and could be sufficiently strongly capitalised for carrying out modernisation and R&D projects. MOL's acquisition of a controlling stake in Slovnaft and TVK could mean the first step of forming such an integrated Central European oil and petrochemical group. Along with its main competitor OMV, MOL has further expansion plans in Central and Eastern Europe.

2.3.4. Production

When studying the separate sectors of the Hungarian economy we found that the chemical industry's output does not follow the general upward trend of industrial production. Since 1992 gross production declined somewhat, the contribution to GDP (the industry's value added) did not change significantly. Contrary to the decline in output the chemical industry is still an important contributor to the economy, accounting for around 14 percent of manufacturing output in 2002 (taking into account the production of chemicals, plastic and oil refining) and 10,6 percent of GDP. In the past 3 years domestic sales stagnated only export sales increased, especially the producers of tyres and plastics gained ground abroad.

The macroeconomic consequences of enlargement for the EU will be moderate, but positive. Several model simulations suggest that it will add about 0.2 % to the overall GDP growth in the EU and around 0.6-0.9% in Hungary (taking into account the positive impact of the common currency on growth) over the coming years. The economic environment for companies is likely to further improve, but a large part of the convergence has already taken place. Trade barriers and most of the technical barriers have been torn down. The enlargement and then later on the introduction of the common currency is expected to foster long term growth in the CEE countries by eliminating transaction costs. According to a

study prepared by the National Bank of Hungary on the possible effects of euro introduction in Hungary[14] suggests that it will have a positive effect on GDP growth by reducing transaction costs. The long term contribution to GDP growth is estimated at around 0.63-0.89 percentage points. GDP growth is likely to be strongly influenced by the growth in consumption, which then will have a positive effect on domestic production of chemical goods as well. The contribution of the total chemical industry to industrial output and GDP has been quite steady at 14% and 10.6% respectively in 2002.

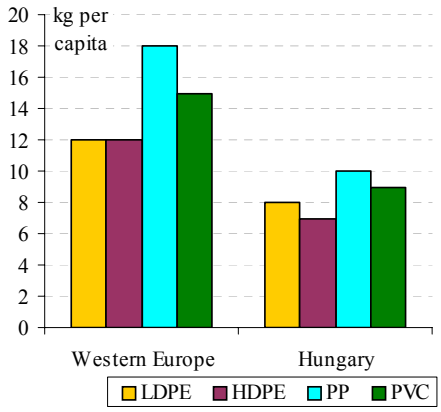
Table 2.3. Distribution of Hungarian chemical production

At current prices in EUR billion	2000	2001	2002	last year=100	contribution to GDP
Oil-processing	2,7	2,4	2,1	86,8	3,0%
Rubber and plastic products	3,1	3,2	3,3	102,8	4,8%
Chemical materials and products	1,4	1,7	1,9	119,4	2,7%
Chemical industry total*	**7,3**	**7,3**	**7,2**	**100,1**	**10,6%**

**without pharmaceuticals*

Source: Hungarian Chemical Industry Association, CSO, IEB

Figure 2.3.
Consumption of selected polymers, 2000

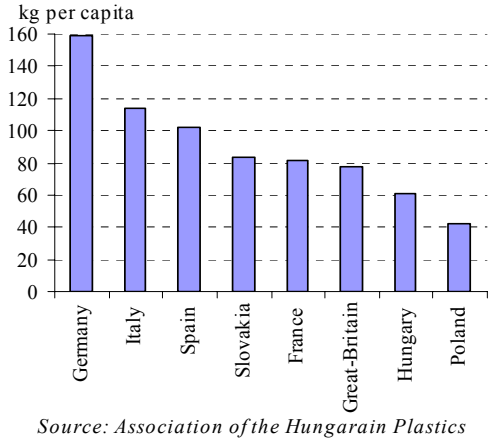


Source:Source: Hungarian Chemical Industry

As economic performance improves Hungarian per capita consumption is expected to approach the EU levels in many areas. For example the number of cars per 1000 person is roughly 250 in Hungary which is about half of that of the EU average. The growth in the number of passenger and transport vehicles has been strong, sales of new vehicles reaches new records every year. Economic prosperity is always accompanied by rapid growth in energy consumption. These factors could result in a growth in demand for fuels between 5-7% annually. MOL forecasts a 7% annual increase of petrochemical products in the CEE region.

Per capita consumption of plastics reached 70 kg/year in Hungary in 2001, which is around half of that of the leading EU countries but is close to the levels of Great Britain or France. Convergence to EU levels is also likely in this respect, although differences in consumer behaviour and environmental regulations may delay the attainment of EU levels. Per capita consumption of plastics is not directly affected by EU accession, but the entry to the single market is likely to contribute to GDP growth. In the long run GDP growth and chemical production show strong correlation, indicating that growth in the output of chemical products is double that of the growth in GDP.

Figure 2.4. Per capita consumption of plastics in Europe, 1999



Source: Association of the Hungarain Plastics Industry

On the supply side the refineries of the region compete with each other. Due to the openness of the Hungarian economy there are no barriers to imports from the surrounding countries. However transportation costs greatly determine the region in which refineries can compete. MOL's refineries provide 80 percent of the domestic need. The quality of petroleum products has been gradually improving due to stringent regulations and market competition.

[14] NBH Occassional Papers: Adopting the euro in Hungary:expected costs, benefits and timing

Another important factor on the supply side is the development in refining capacity. Although this cannot be directly connected to the enlargement either, however decision on investments related to capacity expansions could be strongly influenced by the EU accession. In line with the capacity expansion projects presented in the Hungarian chemical sector introduction, capacities will be doubled in case of a few chemical feedstocks. Besides serving the dynamically increasing domestic market, subject increase is expected to significantly decrease the exports of chemical feedstock. In such a case there could be a shift in export market's structure from the present EU markets to the direction of Central European markets, however, this will not induce a substantial change given that at the time of the closure of investment projects and start of the production (2004-2005) the bulk of the region's countries will become an EU member.

Hungarian producers are among the most competitive in the region in spite of the disadvantages. Environmental costs may lay a heavy burden on both the companies and the governments. Hungary has strong petrochemical and polymer sector with significant exports to the EU. Foreign investors dominate downstream sectors (detergents, coatings, fibres)

In the section below we are focusing on the sub-sectors of the chemical industry and the possible future effects of the EU membership.

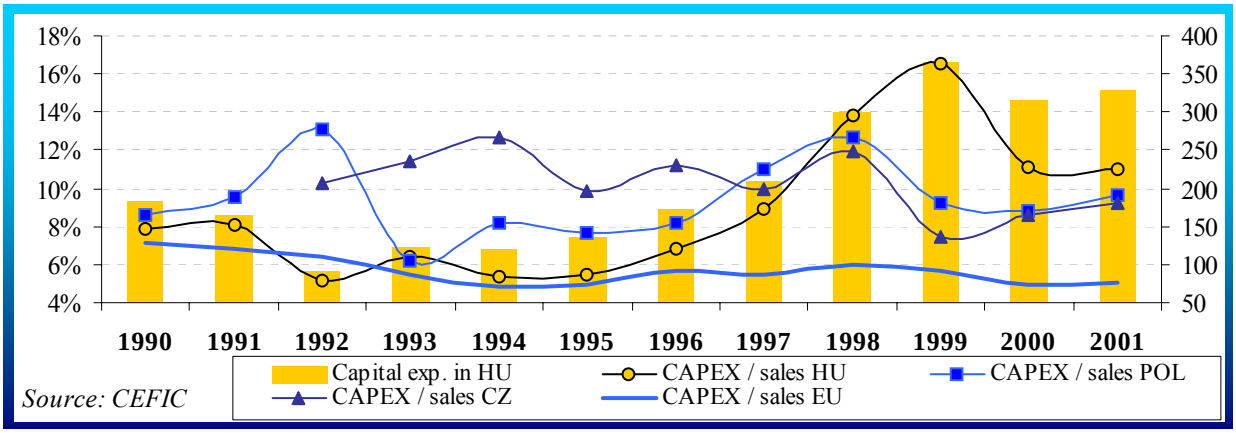
2.3.5. Investments

The privatisation process has already passed off. In 1999 the share of state property corresponded to 12 percent only. State ownership remained only in case of a few specific branches of the industry those are considered strategically important.

Importantly for the future, strategic investors are present in several sectors, such as paints and coatings, detergents, fibres, and pharmaceuticals. The big polymer companies have financial investors and also cross investment between Hungarian producers; they are currently performing successfully through their own efforts.

EU enlargement is not very likely to have strong effects on foreign direct investment (FDI) flows from the EU to Hungary, since barriers to such flows have mostly been eliminated. However Hungary and other accession countries constitute a large potential for future customers and possess a relatively well educated and qualified labour forces that is available at comparatively low labour costs. The last decade has already witnessed increasing economic integration between the EU and Hungary, a process that can only be increased further by the enlargement of the EU.

Figure 2.5. CAPEX to sales in CEE region and EU

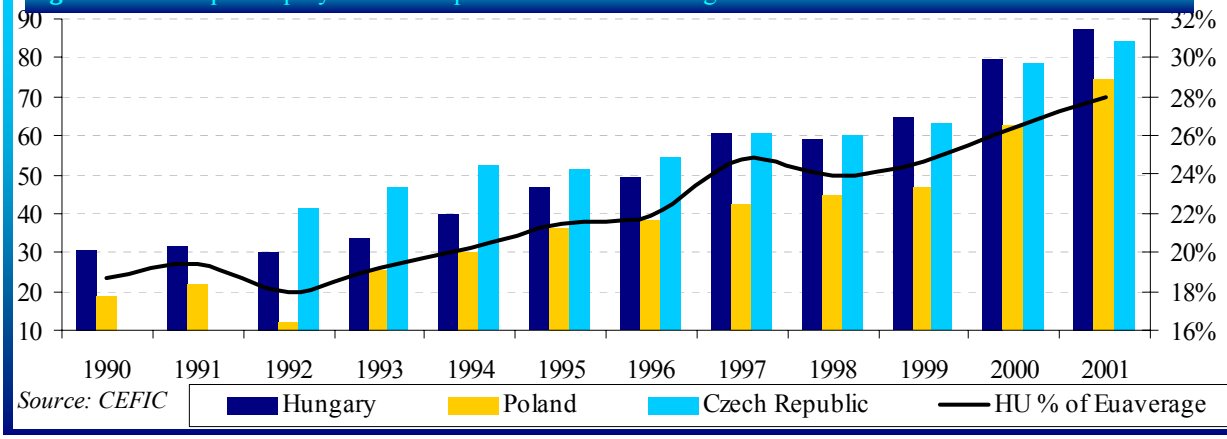


The investments to sales ratio has been in the EU are low compared to Japan (where its between 6-8 percent in the past decade) and the US (above 7 percent annually). In the CEE region the Czech Republic investments have been strong constantly, in Poland it's been quite volatile, while in Hungary after 1995 investments showed significant increase as companies increased capital spending to meet increased demand for their products.

2.3.6. Employment

The chemical industry is rather capital intensive and its contribution to employment in the manufacturing sector is typically lower than its contribution to output. Due to rationalisation, the trends in absolute numbers employed are slowly decreasing. The standard of technical qualification of Hungarian employees is generally high. Due to higher level of qualification workers in this sector are among the best paid in the economy.

Figure 2.6 Sales per employee less competitive even in CEE region



Source: CEFIC

Although significant layoffs took place in the past decade the overall picture is still of low wages and low production per employee compared to the EU although workers in this sector are among the best paid in the economy.

Production per person per year in euro shows an increase at a faster rate than in the EU chemical industry. However absolute levels of production per person are much lower than those in the EU. In most sub-sectors the fixed costs per ton of product are lower in Hungary than in the EU because low wage levels more than compensate for high manning levels. If productivity is to be increased, capital expenditure is often needed, such as on automation of warehousing or of laboratory analysis, or on advanced process control systems on plants. Rationalisation of site layout, such as reduction in numbers of control rooms, may be needed. This suggests that it is not always appropriate to demand EU staffing levels; the saving may not justify the capital expenditure, due to lower labour costs. However, there are also many instances in which employee numbers reflect a previous political commitment to full employment. Some streamlining is therefore often feasible and is desirable to improve the company's position and to prepare for a long-term rise in real wage levels. In the past big companies have introduced large scale rationalisation programs, to improve efficiency, but due to the expensive nature of layoffs and introduction of new technologies these steps only pay off in the long run.

2.3.7. Small and medium sized enterprises

Large companies account for around 80% of total chemical production. Although small and medium sized companies produce a small part of the total output but employ around 30% of all chemical workers.

Small and medium enterprises (SMEs) in many industry sectors face different challenges than larger companies. Small companies typically employ fewer than 50 people and SMEs fewer than 250, and are not subsidiaries of larger companies. Compared to large companies, SMEs may be handicapped by a lack of critical mass in corporate functions, so that legislation and administrative requirements can

prove a disproportionate burden, and marketing may be relatively limited. Small size and lack of access to information also potentially affect innovation. Getting financing can also be more difficult for SMEs since smaller companies are often perceived as being of higher risk. SMEs form a large part of the chemical industry, accounting for the bulk of companies and a sizeable minority - around 30 percent in Western Europe - of total employees. The main area attention should be given for are the following:

- Environmental and other legislation as a major area of investment the costs of even basic compliance limit the resources for growth.

- SMEs are not only sub-contractors, as is often the case in other industry sectors. They perform significant levels of R&D for their own products and processes. Limited access to funding and regulatory barriers is cited as obstacles to commercialising developments.

- SMEs in the chemical industry are significant exporters. Apart from basic factors - costs of delivery and tariffs - challenges in this area include difficulties in finding partners and problems of certification and registration.

- Well-qualified staff is required by chemical industry SMEs, in both technical and commercial fields. SMEs report difficulties in finding appropriate personnel and, because of their small size, in training them.

Hungary has significant SME representation including manufacturers of end products, such as soaps and detergents, or paints and other coatings. There are also many sub-contractors in the automotive or in the consumer goods market. Production of small volume fine and performance chemicals is another area of importance for SMEs.

The integration of SMEs into the international division of labour differs substantially from large enterprises. In particular, micro and small enterprises tend to serve local needs, so that the influence of enlargement on them is likely to be more moderate. Medium-sized companies, on the other hand, often are hampered in their international activities by transaction costs associated with external trade and foreign investment. Transaction costs will decline because of enlargement (even more so with the introduction of the Euro in Hungary around 2008), and this will tend to be more beneficial to SMEs than to large enterprises, especially to those located in "arms length reach" of the borders.

Regions with traditionally low incomes measured in EU standards seem to be more vulnerable than higher income regions, as much labour-intensive production was located in the former as long as the "iron curtain" existed. However, structural change was supported by favourable economic conditions: in the two border regions presented in the case studies, at least, growth was above the national average in the 1990s. In non-border regions, the impact of enlargement has been less strong. To some extent, they are exposed to competition through low wage-cost Eastern European firms and FDI diversion, as they have attracted some labour-intensive production in the past.

The general impact of enlargement on SMEs may be significant in the chemical sector. Environmental problems are abundant and future regulations are likely to lay a heavy burden on SMEs. Nevertheless SMEs are not very likely to experience inextricable hardships from enlargement which will be distinctive in their nature and scale from the effects of wider global changes in international market opportunities and increased competition from lower-cost producers. As a consequence, support policies should not aim at preventing necessary structural change and protecting established market positions of specific enterprises. Rather than supplanting the role of regional and national policy in helping adjusting to the changes EU policy would be most useful in addressing specific areas of international market failure and enhancing the effectiveness of national and regional policy.

Concerning market failures, policies that increase the knowledge and skill base of SMEs make risk sectors less vulnerable and help opportunity sectors to utilise the chance enlargement offers. EU policy should, therefore, continue giving support in these fields as well as acting as a broker of market information and commercial opportunities for SMEs across the EU, including the candidate countries in advance of their accession. These policies also are most appropriate to address the SMEs' shortcomings in making use of the advantages of the international division of labour. - Concerning national and regional policies, the Commission is increasingly having an active role in supporting their efforts through encouraging benchmarking and best practice. Such activities will be of particular benefit to the accession countries, as their SME policies increasingly develop over time. The process of adjusting to enlargement should be viewed as part of the larger policy efforts to integrate the different national markets and commercial environments of the EU into the single market. Nevertheless, the importance of the EU retaining policy flexibility is still acknowledged in being able to respond to sector-specific problems affecting SMEs. Given the continuing uncertainty of how enlargement effects will interact with wider globalisation trends, it is crucial that the European Commission maintains a flexible approach to policy. This means retaining a monitoring role on trends among different groups of SMEs and being prepared to respond with a series of policy measures if action is warranted.

III. Conclusions and proposed measures

3.1. Industry's outlook and economic impact of enlargement

The predominantly privatised and export oriented Hungarian chemical industry has effectively joined the EU already, factors determining the Hungarian chemical industry in the medium or in the longer-term depend primarily on global tendencies of the industry.

Factors determining the global chemical industry (therefore influencing the Hungarian industry as well) in the coming period were detailed by the "Technology Vision 2020", study prepared by leading US chemical professional organisations (American Chemical Society, Chemical Manufacturers Association, Council for Chemical Research, Synthetic Organic Chemical Manufacturers Association)[15]:

1. **The globalisation of the economy** - in case of the chemical industry means primarily the opening of new markets and the access to new feedstock sources. Strengthening competition could further increase industry concentration.

2. **Community's pretension for mitigating the environmental effects of the industry's technology and products.** A key factor of chemical industry's strategy is the mitigation of environmental effects related to the operation not only on input side but in the course of production and utilisation too. In this regard the widespread use of environment-friendly technology solutions and products is essentila. Also finding solutions to recycle waste have an increasing importance. In order to retain sustainable development parallel with environmental protection efforts it is also important to preserve the sensitive equilibrium between the industry's competitiveness and the environmental arguments. This is more or less relevant also for the Hungarian chemical industry, which practically complies with EU regulations. The expected stricter EU regulations might reduce Hungary's competitiveness on non-EU markets after adapting the new regulations.

3. **Pressure from capital markets to increase the industry's profitability**. The chemical industry is capital intensive with high investment needs. In order to reduce the financial costs companies are under pressure to improve efficiency and profitability.
4. **Increasing consumer expectations. Beside** the quality and price of chemical products more and more important are the environmental aspects (i.e. recycling, demolishing).

5. **Growing requirements.** There is an increase in requirements regarding the quality of workforce. Considering the location of feedstock sources, the European chemical industry is in an unfavourable position compared to the Middle East and furthermore the segmentation of the European market compared with the US or Japan could also be disadvantageous. These factors combined with the global tendencies determine the main developments of the European and candidate countries' chemical industry.

The enlargement of the European Union is one of the greatest challenges that European countries will face in the years ahead. The economic impact of enlargement is difficult to assess as the process will be "staggered" so that its consequences will come into force piecemeal over a long period. However, there is little doubt that the overall impact will be positive in the long run, this will not necessarily be true for all sectors, regions, and types of enterprises, especially during the initial phase of integrating new members into the EU. Winner sectors in Hungary are characterised above all by high labour intensity, as the availability of cheap labour continues to be the main source

[15] Referred by János Szépvölgyi, Vegyipar az ezredfordulón (Chemistry on millennial), MTA Budapest,1998.

of comparative advantage for the accession countries. In any case, the labour force in the new members is well educated as a rule, so that not only labour- but also some "skills-intensive" sectors might profit from enlargement. Chemical industry is a capital-intensive sector, but the work force has a higher level of qualification compared to other sectors thus can gain an advantage in term of competitiveness.

The macroeconomic consequences of enlargement will be moderate, but positive. Several model simulations suggest that it will add about 0.2 % to overall GDP growth in the EU and around 0.6-0.9% in Hungary[16] (taking into account the positive impact of the common currency on growth) over the coming years. The economic environment for companies will improve therefore, but a large part of the convergence has already taken.

Although the chemical industry's output has been declining slowly in the past years, its contribution to GDP (industry's value added) remained steady at above 10%. EU accession and the introduction of the Euro is likely to have a positive effect on economic growth and demand for chemical products shows strong correlation with economic performance. Although per capita consumption of chemical products is close to that of some EU countries further long term growth in this respect is plausible.

Hungary has a free trade agreement with the European Union and has been progressively reducing import tariffs. Trade barriers and technical barriers have been removed for the majority of chemicals (there remained some modest levels of protection on detergents and ammonium nitrate, being removed when Hungary joins the EU), thus industry is exposed to competition with EU producers. This means that the accession will probably not effect trade with EU significantly.

Foreign investment has been stronger in the downstream sectors (detergents and paints), and in pharmaceuticals. These investors bring know-how and capital, and will help candidate countries to comply with EU requirements.

Legislative, administrative and environmental requirements of the EU may place a relatively heavy burden on small and medium sized companies. In the Hungarian chemical sector there are many SMEs, but the large part of chemical production is accounted for by the top 10 firms.

Compared to the accession's direct or indirect macroeconomic effects it is relatively easier to measure the impacts of accession on competitiveness. In this regard "the Hungarian chemical industry commands competitive, comparative advantages in European terms, having a strongly skilled manpower and a relatively advantageous salary costs compared to the EU average. For Western European companies Hungary will have a role of a doorstep towards the Eastern European market considering the neighbourhood of Ukraine and nearness of Russia."[17]

The determinant factors of competitiveness in the Hungarian chemical industry are:

Feedstock availability and price is a prime factor of competitiveness. Hungary imports more than 2/3 of its oil and natural gas needs mostly from Russia. Though transport is done through a network of pipelines, dependence on feedstock could cause a fallback in competitiveness compared with EU resulting in a deteriorating competitiveness relative to other regions with abundance of feedstock (such as Middle East).

One of the most important factors of competitiveness in the petrochemical industry derives from the **quality and quantity of capacities**. Processing plants are competitive when they have large capacities (taking advantage of the economies of scale) and use the latest technology. In line with the growth

[16] Attila Csajbók, Ágnes Csermely: Adopting the euro in Hungary: expects costs, benefits and timing, NBH Occasional papers

[17] Pierre Buigues – European Committee Industrial Directorate, leader responsible for chemical industry

prospects of the regional markets there are plans for several capacity expansions in the region. TVK's and Slovnaft's combined ethylene capacity is being raised from 560 Kt./year to 810 Kt./year. Other planned expansions are for HDPE at TVK and polypropylene at Slovnaft. In line with these investments MOL will become the eighth largest bulk polymer producer in Europe and the leading regional oil and petrochemical company. Borsodchem will carry out other significant investments by doubling its PVC, VCM and MDI capacity.

Hungarian petrochemical plants are relatively modern, however the legacy in some cases is of plants using older technology. The capacity extension programs will improve the technology level as well, therefore the Hungarian capacities become competitive in the EU.

The chemical industry is rather capital intensive, but large differences between Hungarian and EU **labour costs** could affect the competitiveness of Hungarian chemical firms. Though significant layoffs took place in the past decade and the labour costs are rising, the overall picture is still of low wages and low production per employee compared to the EU. The level of sales per employee is less than 1/3rd of the EU level and somewhat lower compared to other CEE countries. Wages will probably approach the EU levels in the long run, and changes in the technology are likely to induce restructuring, therefore employment may decrease in the long run parallel with increasing productivity.

Energy costs determine fixed costs considerably. Domestic energy consumers are often favoured with cheaper tariffs than large industrial consumers, leading to a disadvantage in the competitiveness of the Hungarian industry. An important development from this point of view is the liberalisation of the energy sector, which has already started in Hungary. The largest Hungarian chemical companies are between the top energy consumers which are now allowed to enter the free energy market. On the western markets, liberalisation has brought price reductions of about 10-20%, but observers generally believe that prices will fall further.

Important factor for downstream production units, such as polymer plants is the **integration** of the industry. Provided that upstream and downstream plants have common ownership, the total margin can be shared between the plants. This improves the ability to compete at the bottom of the business cycle. Connection by pipeline, such as for ethylene, is one aspect of integration; geographical proximity of several plants with technical synergy is another. In the sense of the integration Hungary represented by MOL plays significant role in the region.

When analysing the competitiveness of chemical industries we have to take into account the classification made by OECD for the technology level of each subsection, level of wages, skills of workers and specific factors determining production. Data related to chemical products is listed in the below table:

Table 1 **Classification of chemical industry's sectors**

Sector	Technology	Labor cost	Qualification	Production
Base chemicals	Medium	High	high qualified	economy of scale
Pharmaceuticals	High	High	high qualified	innovation need
Oil processing	Low	High	high qualified	recourse intensive
Rubber and plastic products	Medium	Medium	low qualified	economy of scale

Source: Csernenszky László, Tanulmány a magyar vegyipar versenyképességéről (Study on competitiveness of Hungarian Chemical industry); Technology and Industrial Performance. OECD, 1996.

Prospects of the **oil industry** in the CEE region are largely determined by the expected growth in fuel and chemicals demand. This market outlook will further accelerate both regional and vertical integration. Changes in the market structure could be linked to the EU enlargement, however the integration has started earlier. Stricter environmental regulations induced by accession, require oil companies to

implement environmental investments, improving continuously the product quality. The cost of these investments will probably not be followed by an increase in products prices, obliging companies to increase efficiency.

Within the CEE region a significant increase is expected on the market of **petrochemical** products bringing considerable capacity expansions in more segments of the chemical product chain. In line with increasing capacities, competitiveness of Hungarian petrochemical companies will remarkably improve compared to the EU average. In the petrochemical industry the main concern is the availability of feedstock in adequate quantity and quality. Capacity expansion will partially fulfil the need of sufficient feedstock supply. Regarding the feedstock availability it is also important to examine the possibility to develop petrochemical segments using natural gas as feedstock available in the region at a relatively lower price.

Expansion of polymer production could be considered the right direction for the efficient olefin processing. Due to environmental concerns specialisation to the production of polypropylene and polyethylene seems to be a rational step. In line with increasing polymer production it might be needed to further develop the secondary processing of plastic or waste-disposal to meet environmental regulations.

The general rule concerning the growth prospects of **plastic** consumption (generally increasing twice as faster as GDP[18]) could be applied in Hungary as well. In line with this Hungarian plastic consumption increased by 7% annually in the past years. With this growth dynamics it seems achievable an annual consumption of 850 kt plastic materials per year by 2005, reaching the level of plastic consumption of France or the UK.

Profitability level of plastic processors (supplying multinational companies) has deteriorated as a result of the recent migration of multinationals to cheaper markets. To offset fallback in sales caused by lost markets, plastic processors implemented rationalisation and cost reduction, however the effects of these measures are limited. This will expectedly result in further concentration in this industry segment.

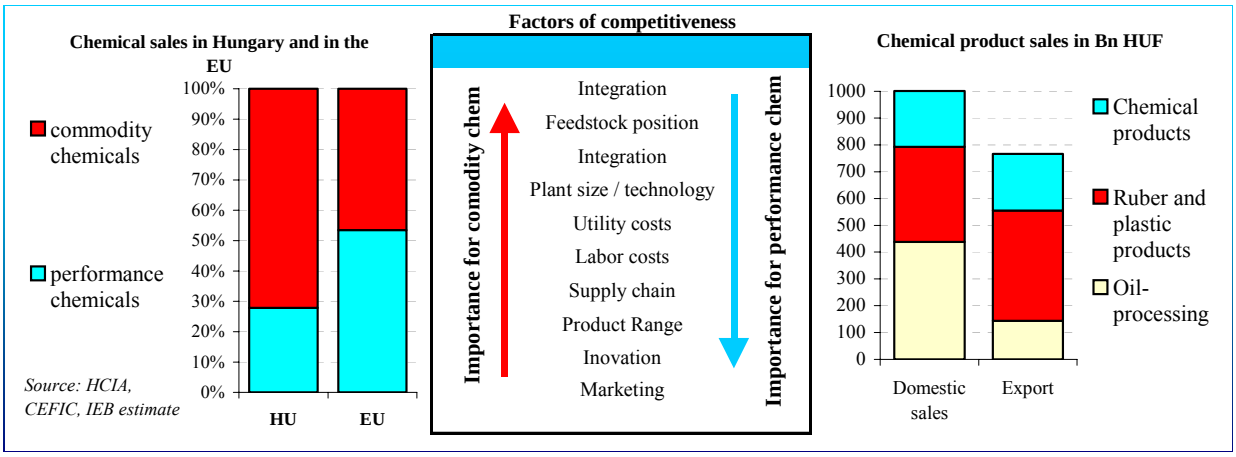
In the late 80's the Hungarian **fertiliser** consumption per acre was close to the EU average. Fallback in consumption (caused by the changes in the agricultural policy, privatisation and restructuring of food industry) lead to excess capacities in spite of industry reorganisation. In terms of feedstock availability (natural gas for nitrogen based product group) this industry segment is relatively competitive compared to EU.

Currently low labour costs and low transportation costs helped Hungarian **fibre** producers gain market share in the Western European markets but in the longer run the industry is vulnerable to the imports of both fibres and finished textiles from low cost producing regions, of which Asia is the most important.

Hungary has a strong tradition in **fine and performance chemicals**, including pharmaceuticals. Agrochemicals -primarily biocides- are a significant part of Hungary's fine and performance chemicals, where the Hungarian companies export around 50% of their output.

[18] Dr. Lakatosné Dr. Nemes Sarolta: A magyar műanyagipar számokban, (Hungarian plastic industry), 2003

Figure 3.1. Structure of Hungarian chemical industry



Commodity chemicals (having already strong competitive positions) currently dominate production of the Hungarian chemical industry, however the weight of performance chemicals legs behind the EU's figure. In line with this structure, the Hungarian chemical industry (without the pharma subsection) is increasingly exposed to the industry's cyclicality and is more dependent on feedstock and is less profitable compared to its European peers. Considering the availability of workforce in Hungary, the change in the industry's structure would be desirable in the longer term towards the less cyclically dependent, more innovative and more value added producing sectors.

Prospects of the Central European chemical industry depend on the self-maintenance in the currently small but growing local markets, on efficiency improvement and on global factors such as the chemical cycle. In case of the first two factors (controllable by management) the prospects for the Hungarian chemical companies are promising, although they can not influence the developments of global factors (for example the chemical cycle). Market of chemicals and feedstock has been very hectic in the last period and according to the current forecasts an upswing in the chemical cycle is expected in 2004-2005.

3.2. SWOT analysis of Hungarian Chemical industry in mirror of EU enlargement

Strengths	Opportunities
Hungary is one of the most prepared country for accession in the region, with relatively stable economy, strong foreign investments and a forwardness legislation The chemical industry is largely privatised Well positioned for trade with the EU with long-established trading partners The large olefin and polymer producers are commercially successful Industry has been rationalised with closure of some units and remaining production plants appear broadly competitive International producers have a strong presence in the downstream sectors Net imports are moderate in the downstream Tradition and expertise in fine chemicals Presence of foreign strategic investors in the pharma companies	Strong growth in demand for most chemical products is expected Liberalisation of the energy market Restructuring is needed Hungarian companies play a significant role in the regional integration Expansions in capacity are planned
Weaknesses	**Threats**
The structure of the sector is orientated toward the base and commodity chemicals, depending largely on uncontrollable outside factors such as the chemical cycle Dependence on imported feedstocks	Increasing labour costs Environmental investments are needed

Appendix 1 Sales of chemical products in Hungary, 2001

Sales of chemical products *at current prices in million euros*	domestic	export	export share	total	percent
Coke production	52	2	3,5%	**53**	0,7%
Oil refining	1752	589	25,1%	**2341**	32,2%
Coke prod., oil ref.	**1804**	**591**	**24,7%**	**2394**	**32,9%**
Rubbers, tubes	31	170	84,5%	**201**	2,8%
Tyre restoration	7	1	15,1%	**8**	0,1%
Other rubber prod.	67	127	65,4%	**195**	2,7%
Rubber products	**105**	**298**	**73,9%**	**404**	**5,6%**
Plastic film, tube	209	132	38,7%	**341**	4,7%
Plastic packaging mat.	217	163	42,8%	**380**	5,2%
Plastic building mat.	45	47	50,7%	**92**	1,3%
Other plastic prod.	280	230	45,1%	**510**	7,0%
Plastic products	**751**	**571**	**43,2%**	**1322**	**18,2%**
Rubber and plastic products	**856**	**870**	**50,4%**	**1726**	**23,7%**
Industrial gases	104	8	7,3%	**112**	1,5%
Dyes and pigments	39	22	35,3%	**61**	0,8%
Other inorganic chemicals	39	51	56,7%	**89**	1,2%
Other organic chemicals	39	79	66,8%	**119**	1,6%
Fertilizers, nitrogenous compounds	111	20	15,3%	**131**	1,8%
Plastic feedstock's	430	579	57,4%	**1009**	13,9%
Chemical feedstock prod.	**762**	**759**	**49,9%**	**1521**	**20,9%**
Agrochemicals	**25**	**31**	**55,2%**	**57**	**0,8%**
Dyes, coatings	**109**	**6**	**5,4%**	**115**	**1,6%**
Pharmaceutical feedstock's	4	13	75,2%	**17**	0,2%
Pharmaceuticals	350	728	67,5%	**1078**	14,8%
Pharmaceutical feedstock's and prod.	**354**	**742**	**67,7%**	**1096**	**15,1%**
Detergents	135	76	35,9%	**211**	2,9%
Toiletries	20	23	53,4%	**43**	0,6%
Detergents and toiletries	**155**	**99**	**38,9%**	**254**	**3,5%**
Explosives	**3**	**4**	**57,1%**	**6**	**0,1%**
Adhesive	**1**	**0**	**6,3%**	**1**	**0,0%**
Fibres	**17**	**42**	**71,2%**	**59**	**0,8%**
Other chemicals	**37**	**16**	**31,0%**	**53**	**0,7%**
Chemical feedstock and product	**1460**	**1696**	**53,7%**	**3156**	**43,4%**

Source: Hungarian Chemical Industry Association, CSO

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