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The Expected Effects of the EU Accession on the Chemical Industry in Poland

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1. Introduction

In 2002, the value of world chemical production totalled around €1,400 billion. Approximately one third of that production originated in Europe. The Polish chemical sector, with its total value of production amounting to about €12 billion, accounted for approximately 2.6 percent of the European chemical industry output. Consequently, Poland was ranked the sixteenth in Europe in terms of the value of chemical production.

There is a substantial diversification in the features of branches making up the chemical industry. This involves differences in the definition of the chemical sector itself, which covers its different sections depending on the assumed approach. A detailed presentation of the scope of the analysis provided by this report is contained in Chapter 2.

Variations in the product range implies, inter alia, differences in applied technologies, in the degree of their advancement and in economic results generated by them. In Poland's conditions this also corresponds with variations in the ownership structure. Apart from the sector of large and modern enterprises operating within structures of international corporations (e.g. the tyre industry), and the sector of small and medium-sized private enterprises there is also a sector of big enterprises controlled by the State Treasury. The last of the mentioned groups of operators, i.e. so-called Heavy Chemical Industry plants, deals mostly with manufacture of chemical fertilizers and basic chemicals. They are sold as both final products and semi-products subsequently used by other entities.

An urgent need for restructuring and modernisation of Heavy Chemical Industry plants has found its reflection in the "Strategy for the chemical industry in Poland until 2010" adopted by the Council of Ministers in June 2002. Most of the implementation period for that strategy is scheduled for the early years of Poland's membership in the European Union. Hence, in the coming years the sector's operation will be subject to two parallel processes: adjustment to conditions of the Single European Market on the one hand, and restructuring in accordance with a government strategy on the other.

The report is focused mostly on issues connected with development opportunities of the sector, tendencies in foreign trade, foreign investment inflow, developments in labour markets and regulatory changes. Hence, major problems of the sector have been presented against the background of integration and modernization processes. Consequences of these processes for the sector as a whole have been in the focus of attention, while the problems of particular industries of the sector have become of secondary relevance.

2. Characteristics of the sector

The chemical industry (NACE sections 24 and 25) covers nine segments of production, corresponding to NACE groups:

- Manufacture of basic chemicals,
- Manufacture of pesticides and other agro-chemical products,
- Manufacture of paints and varnishes,
- Manufacture of pharmaceuticals,

Manufacture of soap and detergents, cleaning and polishing preparations, perfumes and toilet preparations,

- Manufacture of man-made fibres,
- Manufacture of rubber products,
- Manufacture of plastic products, and
- Manufacture of other chemical products.

Manufacture of refined petroleum products (NACE group 23.2), being usually associated with the broad-sense chemical sector, remains beyond the scope of the present analysis. Due to its completely different nature, the above-mentioned NACE group 24.4 – *manufacture of pharmaceutical products* - has also been excluded. The remaining eight groups are divided into twenty five detailed classes[1].

2. 1. Entities operating in the chemical sector

According to Central Statistical Office (GUS) data, in the middle of 2002 the group of chemical industry enterprises consisted of 1,365 entities employing above 9 persons. Their total employment amounted to 151,382 persons. During the analysed period the number of enterprises operating in the sector showed an increase; while an opposite trend was recorded in employment.

Table 1 presents data relating to employment and the number of entities in the sector. The clarity of the analysis is to some extent obscured by the change, initiated in 2000, of the methodology of gathering data by GUS.

[1] The list of NACE classes covered by the report is contained in the Annex 2.

Table 1: Number of entities and number of persons employed in the Polish chemical sector enterprises in 1996 – 2002

	Number of entities *	Number of employed persons*
1996	435	157 602
1997	478	152 215
1998	567	144 416
1999	639	150 282
2000	1 425	168 158
2001	1 456	153 570
June 2002	1 365	151 382

**Until 1999 the data cover entities employing over 49 persons, and since 2000 those employing over 9 persons.*

Source: GIME calculations based on GUS statistics.

In 2002, the group of top 500 Polish enterprises included as many as 30 chemical sector companies. Table 2 presents the main indicators for ten largest chemical industry companies[2].

[2] *Lista 500*, Gazeta Bankowa April 22, 2003. The complete list of top thirty chemical sector companies in Poland is contained in the Annex 1.

Table 2: Main indicators of Polish largest chemical industry enterprises in 2002

No	Rank on the "Top 500 List"	Company	Revenue (PLN million)	Gross profit (PLN million)	Net profit (PLN million)	Number of employed persons	NACE
1	49	Unilever Polska SA Warszawa*	2 250.0	n.a.	n.a.	2 400	2451
2	52	Procter & Gamble Operations Polska sp. z o.o. Warszawa	2 162.8	n.a.	n.a.	1 064	2452
3	81	Stomil Olsztyn SA	1 331.0	156.7	106.5	n.a.	2511
4	94	Zakłady Chemiczna Police SA	1 190.1	n.a.	n.a.	3 079	2415
5	98	Zakłady Azotowe Puławy SA	1 181.6	-119.7	-114.8	3 416	2415
6	102	Anwil SA Włocławek	1 141.6	27.7	18.9	1 528	2416
7	110	Dębica SA	1 068.5	109.2	77.9	3 309	2511
8	123	Avon Operations Polska sp. z o.o. Garwolin	964.5	89.2	62.0	2 715	2452
9	127	Henkel Polska SA Warszawa	932.1	75.4	50.5	1 022	2451
10	129	Zakłady Azotowe Kędzierzyn SA	916.2	-46.7	-46.7	1 800	2415

**Unilever declares* manufacture of soap and detergents, cleaning and polishing preparations *as the main field of its activities. Nevertheless, it is only a part of its production profile.*

Source: Lista 500, Gazeta Bankowa, April 22, 2003.

Private sector accounts for a vast majority of chemical industry enterprises in Poland. However, the recent results of privatisation of major chemical plants haven't proved satisfactory. For example, no strategic investors have been found so far for most of the largest Polish Heavy Chemical Industry (HCI) plants.

The main reasons for the poor privatisation record include, among others, obsolete product range of particular plants, overemployment, excessive social package demands put forward by trade unions, and a tendency towards selling to investors only separate parts of plants .

2. 2 Diversification of the sector

Considerable diversification of the product range is one of the characteristic features of the chemical sector. Most of the products, however, are characterised by common raw materials and semi-product base. Semi-products for the entire chemical sector are provided by the so-called Heavy Chemical Industry plants. This notion covers the following sub-sectors: organic chemistry, inorganic chemistry, sulphur processing and coke chemistry.

From the point of view of production processes, the organic chemistry sub-sector is the basic division of the Heavy Chemical Industry. Petroleum, as well as petrol, natural gas and petroleum, and tar residues obtained from it are the basic materials used in organic chemistry. The major semi-products of the organic sub-sector are of key significance for the chemical sector. They are used, among other things, in manufacture of engineering and consumer products (plastic and rubber articles, man-made fibres and household chemistry articles), as well as in branches being major recipients of chemical industry products (e.g. manufacture of

electrical machinery and apparatus, manufacture of electronic equipment, the automotive industry, construction, manufacture of furniture, agriculture, etc.).

The organic chemistry sub-sector is followed in terms of relevance for production processes by the inorganic sub-sector, providing mostly semi-products for the organic sector (e.g. chlorine). The raw material used here are, in the first place: rock-salt, limestone, sulphur, limenite, as well as titanium slag.

Unlike the two sub-sectors mentioned above, the fertilizer sub-sector, manufactures mostly final product, namely chemical fertilizers used in agriculture. Natural gas, phosphate rocks and potassium salts are basic raw materials used in this sub-sector.

The sulphur processing sub-sector is one of providers of semi-products for the fertilizer and organic industries. Products manufactured in plants operating in this segment are also, to some extent, final goods. Elemental sulphur acquired from natural sources and desulphurisation processes is a raw material in this case.

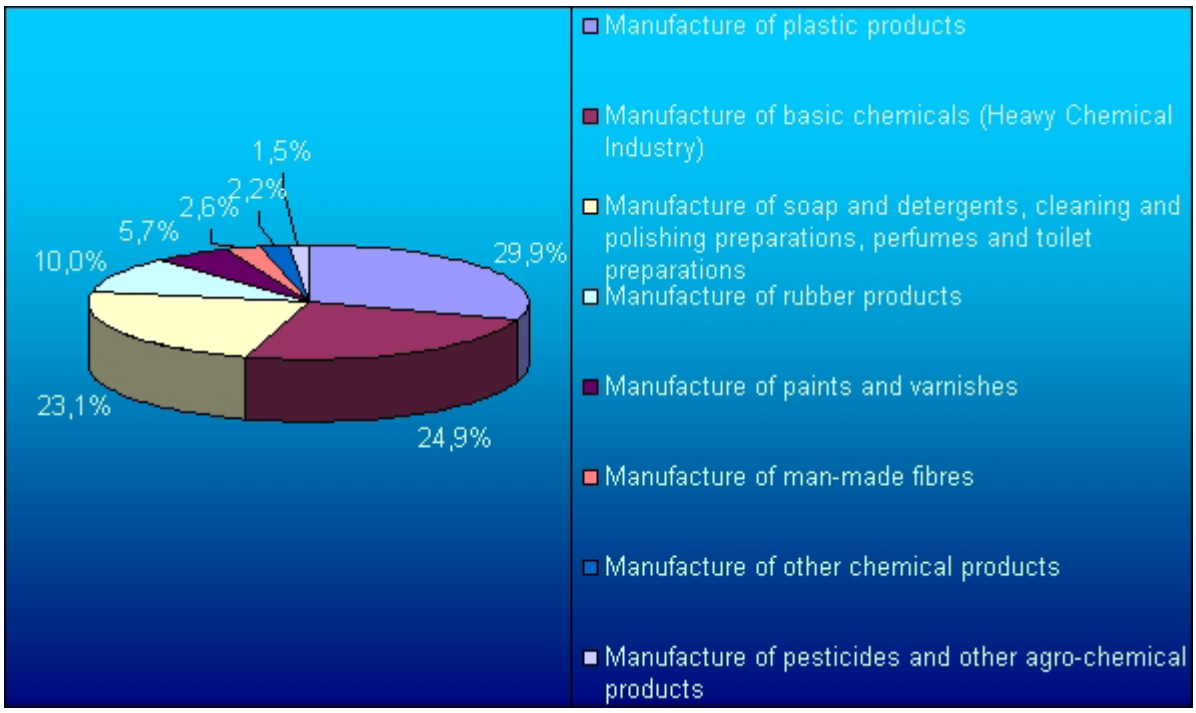
Coke chemistry constitutes the last sub-sector of the Heavy Chemical Industry. Main raw materials used by this industry are tar, benzene and raw coal. Products manufactured by the sub-sector are either used by the remaining sub-sectors, or sold as final goods (e.g. coke).

In subsequent production processes, products manufactured by Heavy Chemical Industry plants become, to a great extent, semi-products for producers of common use goods (e.g. household chemistry, cosmetics, rubber products, plastic packaging, plastic products for construction, pharmaceuticals[3] and many other), as well as parts used in production of other goods.

Chart 1 presents production structure of the chemical sector in the first six months of 2002 based on total revenues.

[3] Excluded from this analysis.

Chart 1: Production structure as share of total revenue of the chemical sector in the first six months of 2002



Source: GIME calculations based on GUS statistics.

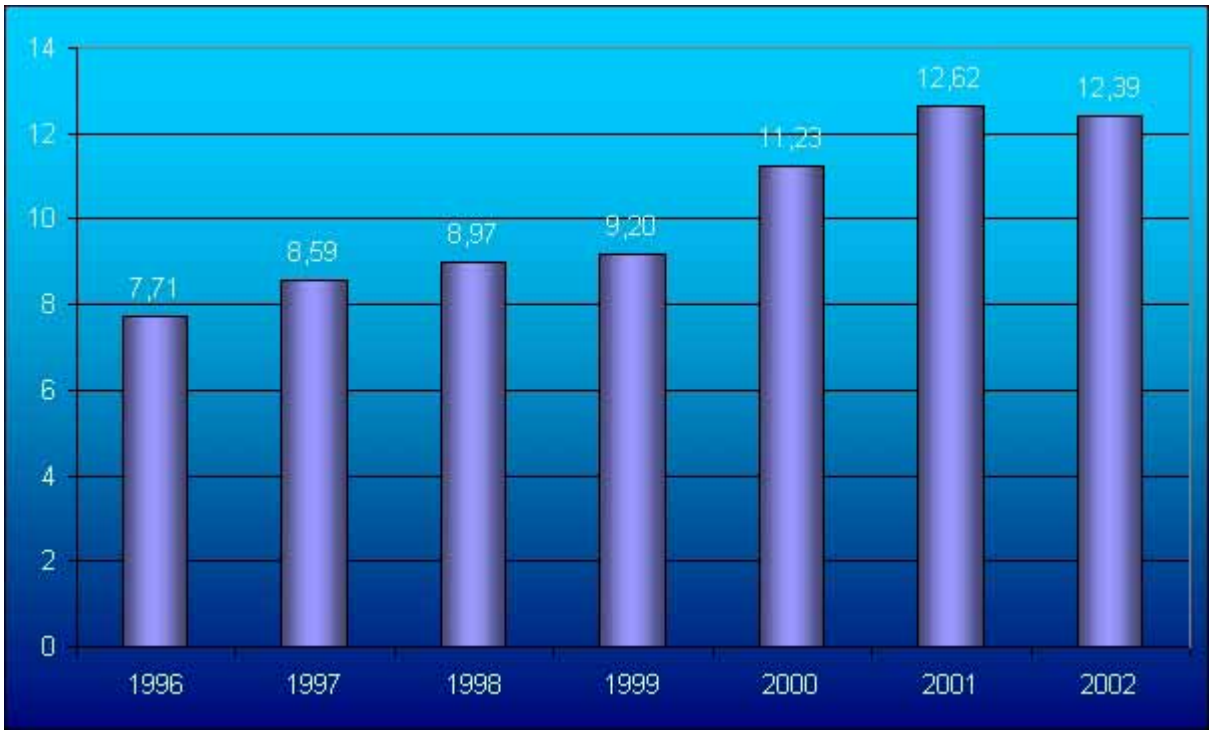
3. The impact of integration with the EU on the chemical sector in Poland

3. 1. Growth rate of the chemical sector in Poland

In 2002, chemical sector's revenues accounted for some 8 percent of total manufacturing industry revenues. In 1996 – 2001 total revenues of the chemical sector increased in both real and nominal terms. In 2002, for the first time during the analysed period, a drop in revenues was observed. Among the main causes of this decline one should mention the slowdown of economic growth, decline of real prices for some products of the sector, growth of raw material prices (mostly natural gas) and sluggish restructuring of the sector. Hence, these factors were mostly of an exogenous nature.

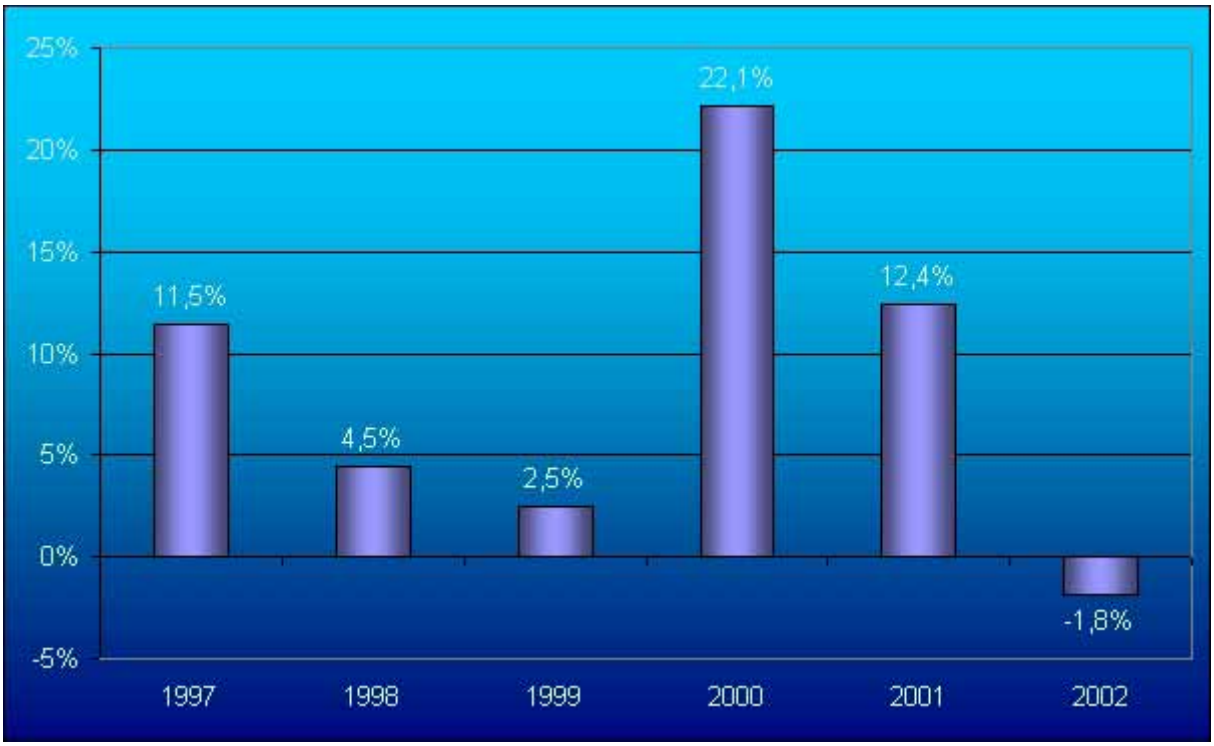
Chart 2: Total revenue of the chemical sector in Poland in 1996 – 2002

(€ billion, current prices)



Source: GIME calculations based on GUS statistics.

Chart 3: Real growth rate of chemical sector revenues in Poland in 1997 – 2002 (percent)



Source: GIME calculations based on GUS statistics.

In the medium term perspective, chemical sector growth in Poland will be determined by two parallel processes: integration with the European Union and restructuring conducted in compliance with the government „Strategy for the chemical industry in Poland until 2010"[4]. The overlapping of both processes should affect the sector's growth both on the supply and demand side.

First, by speeding up the rate of economic growth, Poland's accession to the European Union will indirectly contribute to a rise in demand for products of the broad-sense chemical sector. This demand will be satisfied partly by imports, and partly by an increase in domestic production.

On the supply side, step-by-step liberalisation of the raw material market for Heavy Chemical Industry plants (mostly natural gas), will be a significant factor influencing development opportunities of the sector after accession. The price for natural gas is one of the factors affecting the profitability of the entire chemical sector[5]. At present the supply market for gas in Poland is monopolized by Polskie Górnictwo Naftowe i Gazownictwo (PGNiG) S.A. – (the Polish Oil and Gas Mining Joint Stock Company). Prices for gas set by that monopolist are higher than in many countries of Western Europe.

In the European Union the common rules for the internal market in natural gas are regulated by Council Directive 98/30/EEC of the European Parliament and of the Council, which Poland accepted without derogations and transitional periods in the course of accession negotiations. The freedom to choose a supplier of raw materials, consistent with EU regulations, should to a major extent contribute to a cut in production costs, by the same token improving the competitiveness of Polish plants.

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[4] *Strategy for the chemical industry in Poland until 2010*, The Council of Ministers, June 4, 2002. For a detailed analysis of this strategy see the chapter on the sectoral policy of the state.

[5] For example, in production of fertilizers it accounts for 40 to 80 percent of variable costs of production.

Other underlying factors of chemical sector development following Poland's accession to the European Union are associated, among other things, with a revival of investment activity, intensification of consolidation trends or the need for adjustment to environmental protection requirements, will be presented in particular chapters of this study.

Generally, however, it should be pointed out that integration with European structures does not involve any serious threats for the chemical sector in Poland. Progressive liberalisation of foreign trade and investment capital flows initiated in the mid-1990s, and the progress already achieved in introduction of environmentally-friendly solutions and regulations in the field of safety at work suggest that the process of the sector's integration with the Single European Market will not be a shock.

The concerns that Poland's entry into European structures might deprive the chemical sector of mechanisms of domestic market protection against foreign competition seem unjustified. Namely, trade protectionism has been largely eliminated from the Polish chemical sector's trade with the EU-Fifteen, revealing a substantial competitive advantage of the EU industry over Polish industry. A sizeable trade deficit[6] on Poland's part is a consequence of that.

3. 2. Foreign trade

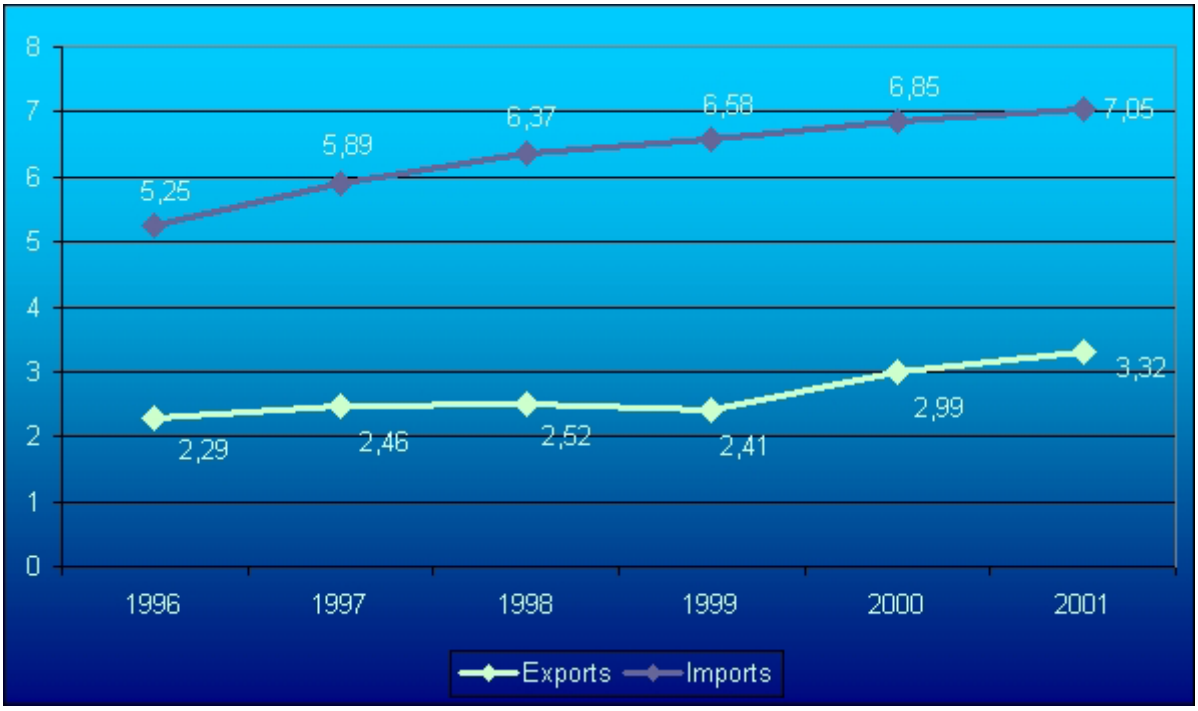
The value of Poland's chemical exports, expressed in US dollars (at current prices) increased by above 44 percent in 1996 – 2001. At the same time, the rise in the volume of imports was somewhat slower (by 34 percent). Despite that, trade deficit in chemical sector products went up by 26 percent, from $2.96 billion to $3.73 billion. In 2001, the trade deficit in chemicals accounted for above 26 percent of Poland's overall trade deficit.

It seems relevant that the trade deficit in chemical sector products is of a structural nature. In Poland many groups of advanced products the demand for which grows at the fastest rate are either not manufactured at all, or manufactured only in quite marginal quantities.

[6] For a detailed analysis of foreign trade in chemical products see chapter 3. 2.

Chart 4: Export and import of the chemical sector in Poland in 1996 – 2001

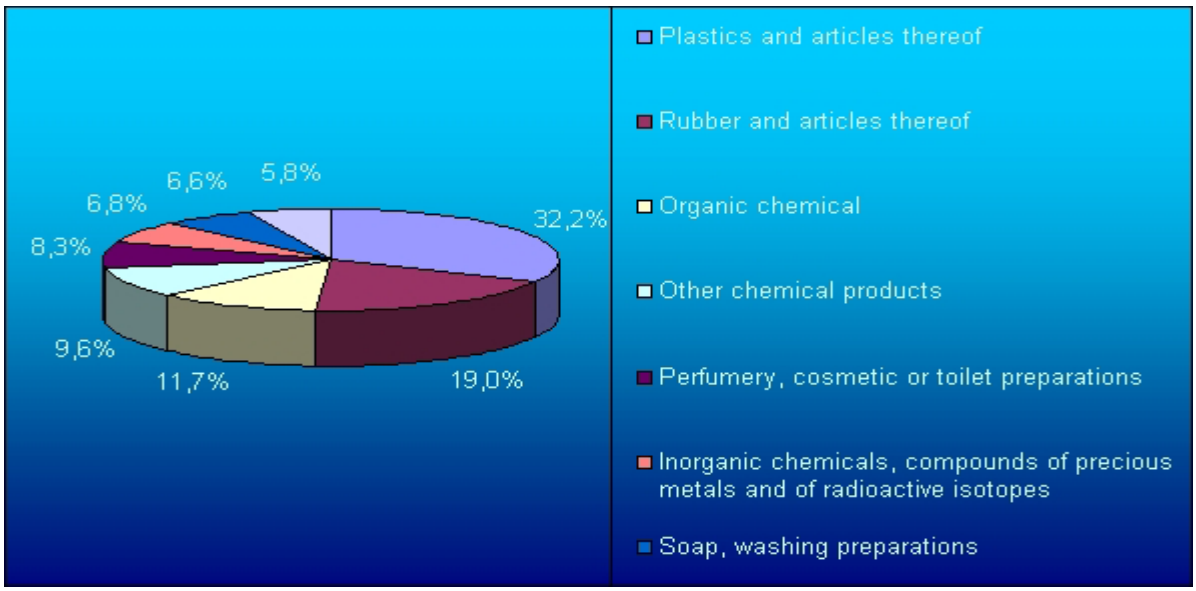
($ billion, current prices)



Source: GIME calculations based on GUS statistics.

Chart 5 presents the commodity composition of Polish chemical exports in 2001. Compared to 1996, the share of exports of *plastics* rose sizeably – by almost 10 percentage points, while the export of *rubber and articles of rubber* went up by almost 6 percentage points. The steepest decline of the share of chemical exports was recorded in the case of *fertilizers and organic chemicals* – by 7.6 and 6.6 percentage points, respectively. The shares of the remaining commodity groups remain relatively stable.

Chart 5 Composition of Polish chemical exports in 2001 (according to PCN classification)



Source: GIM

E calculations based on GUS statistics.

Chemicals are exported from Poland mostly to three major groups of countries: the European Union – accounting for above 54 percent of these exports, the former USSR countries – accounting for above 20 percent of exports, and CEFTA countries – accounting for almost 14 percent. In imports, Poland's dominating trading partners are European Union countries – almost 74 percent of total imports, CEFTA countries – 8.5 percent of imports, and developing countries – almost 6 percent of imports. Poland has been running chemical trade deficit with all groups of countries, except for the former USSR, with European Union Member States accounting for 85 percent of that deficit.

Taking into account the present lack of customs barriers to chemical trade between Poland and the EU, integration will not have a direct effect on trade links. According to assumptions adopted by the government, implementation of the second stage of the already mentioned medium-term strategy for chemical industry development in Poland is to be a factor contributing to reduction of Poland's chemical trade.

Poland's foreign trade in chemical products can be positively affected by the accelerated inflow of foreign direct investments after integration with the European Union. In recent years, the chemical sector industries with the highest foreign capital inflow figures (*manufacture of rubber and manufacture of plastics*), reported higher shares in exports than in imports. This factor contributed to a reduction of deficit in these industries. For example, in the year 2000, rubber industry companies with foreign participation accounted for above 85 percent of exports and almost 70 percent of imports, and as a consequence their trade closed with a surplus. Imports of state-of-the-art technologies and *know – how* provide a mechanism for foreign trade growth of companies with a high level of foreign capital.

The process of Poland's preparations for joining the European Monetary Union is associated with another group of factors affecting the chemical trade following the accession to the EU. According to the position taken by the Monetary Policy Council, Poland might join the EMU as early as 2007. That would require its participation in the Exchange Rate Mechanism 2 (ERM 2), limiting the band of fluctuations of the zloty exchange rate against the euro. If the initial exchange rate is set at an appropriate level, this will have a favourable effect on the trade volume thanks to bringing down the degree of investors' uncertainty and to reduction of the exchange rate risk. In a longer term, possibly as soon as 2007, the monetary policy risk and the exchange rate risk may be fully eliminated.

3.3 Intra-industry trade

Intra-industry trade is defined as simultaneous imports and exports by a specific country or group of countries of products and their constitutive parts originating in the same industry, over a given period of time (usually a year). This phenomenon is particularly intensive in trade of developed countries, similar to one another in terms of endowment with production factors and techniques, consumer preferences and *per capita* income level. The composition of the European Union's trade provides a good example here as, at present, more than half of its volume is of an intra-industry nature.

In classical models of international trade, advantages from international trade arise from comparative differences between countries in their production technique and, consequently, in productivity of production factors (Ricardo's theory), and from relative proportions of production factors in economies (Heckscher – Ohlin theory). These theories identify differences between trading countries as a source of advantages from trade. They can serve as a basis for explaining inter-industry trade development.

Economic convergence of developed countries, taking place under pressure of accelerated economic development and globalisation causes growing similarity in big groups of countries, among other things in terms of relative endowment with production factors and techniques. A rise in the level of *per capita* income

may also stimulate consumer demand for more and more diversified goods. Both these processes lead to growing significance of intra-industry trade.

Economies of scale and growing diversity of products available on the market are the basic sources of advantages from intra-industry trade. The share of intra-industry trade in total foreign trade turnover depends on the relative difference in endowment with factors of production and similarity of the production processes applied. The smaller the relative difference in endowment with factors of production and the more similar the technologies, the higher the share of intra-industry trade in total foreign trade. Hence, the higher the degree of economic convergence (at least at a given industry level) the larger the intra-industry trade and economies of scale.

Definitions of both similarity of goods and industry are the basic problem encountered while measuring the intra-industry trade level. Data aggregation level exerts a strong impact on the statistical picture of the analysed phenomenon. Obviously, the higher the data aggregation level, the higher the share of intra-industry trade in total foreign trade turnover. The reverse is the case with growing degree of data disaggregation.

The so-called Grubel – Lloyd formula is the best-known formula, for setting the intra-industry trade level. It takes the following form:

$$W_i = \left(X_i + M_i\right) - \left|X_i - M_i\right|,$$

where $\left(X_i + M_i\right)$ stands for the global value of foreign trade by industry "i", i.e. the sum of exports (X_i) and imports (M_i) at specified time, while $\left|X_i - M_i\right|$ stands for absolute value of difference between exports and imports of products of industry "i". In order to arrive at comparable data for different industries, the formula becomes modified by presenting intra-industry trade against the background of the overall value of foreign trade by given industry:

$$R_i = \frac{\left(X_i + M_i\right) - \left|X_i - M_i\right|}{\left(X_i + M_i\right)}$$

The average share of intra-industry trade in total trade of the sector can be calculated by means of the following formula:

$$R_S = \sum_{i=1}^{n} \frac{\left(X_i + M_i\right) - \left|X_i - M_i\right|}{\left(X_i + M_i\right)}$$

The value of R_i and R_S ratios ranges from 0 to 1, whereas *R = 0* means lack of intra-industry trade, and *R = 1* means that the entire trade by a given industry is exclusively of intra-industry trade nature. Hence, the closer to 1 the R_i or R_S value, the higher the intra-industry trade share in the overall value of foreign trade of a given industry.

The Gdansk Institute for Market Economics has calculated R_i values for twelve chemical sector industries (according to PCN classification) in 1996 – 2001. Additionally, R_S ratio, indicating the average share of intra-

industry trade in total foreign trade in chemical sector products has been calculated. The results are shown in Table 3.

Table 3: Intra-industry trade and the total value of foreign trade by industry

R value *	1996	1997	1998	1999	2000	2001
R_{28}	0.95	0.99	0.99	0.85	0.88	0.92
R_{29}	0.75	0.73	0.72	0.68	0.72	0.66
R_{31}	0.51	0.63	0.66	0.85	0.67	0.89
R_{32}	0.25	0.26	0.26	0.24	0.26	0.32
R_{33}	0.66	0.75	0.64	0.62	0.74	0.82
R_{34}	0.73	0.80	0.80	0.72	0.78	0.86
R_{35}	0.53	0.39	0.36	0.36	0.47	0.58
R_{36}	0.68	0.69	0.83	0.98	0.67	0.83
R_{37}	0.15	0.22	0.14	0.07	0.09	0.08
R_{38}	0.18	0.19	0.19	0.19	0.21	0.22
R_{39}	0.42	0.43	0.42	0.43	0.50	0.55
R_{40}	0.82	0.79	0.83	0.85	0.90	0.99
Chemical sector	0.61	0.59	0.57	0.54	0.61	0.64

**Notes:*

28 Inorganic chemicals; compounds of precious metals and of radioactive elements or of isotopes
29 Organic chemicals
31 Fertilizers
32 Tanning extracts, dyes, varnishes, putty, inks
33 Perfumery, cosmetic and toilet preparations
34 Soap, washing preparations
35 Albuminoidal substances
36 Explosives
37 Photographic goods
38 Miscellaneous chemical products
39 Plastics and articles thereof
40 Rubber and articles thereof

Source: GIME calculations based on GUS statistics.

In 1996 – 2001, the average share of intra-industry trade in the chemical sector's total foreign trade was 59 percent. In 1996 – 1999 the share of intra-industry trade in total trade was declining, while in 2000 – 2001 it was growing. It is not possible to identify unequivocally an upward or downward trend on the basis of obtained results. Therefore, it seems that one cannot claim that during the analysed period a convergence of the Polish chemical sector with global trends was the case. In this context convergence means the overall level of approximation of the Polish sector in terms of applied techniques, production factors, productivity, etc., to the total average for advanced economies.

It may be interesting to analyse variations in the share of intra-industry trade in particular segments of the sector. In 2001, the fluctuations of R_i value in 2001 ranged from 8 for photographic goods to 99 percent for rubber articles. A relatively high share of intra-industry trade in total trade of the sector was found mostly in

industries in which the exports/ imports ratio was the highest (see Table 4). This is an indication of relatively higher competitiveness of these industries compared to the remaining segments of the sector.

Table 4: Export/import ratio and intra-industry trade in the Polish chemical sector w 2001

PCN section heading*	Export/Import ratio (percent)	Share of intra-industry trade
28	85.41	0.92
29	48.92	0.66
31	124.22	0.89
32	19.30	0.32
33	68.88	0.82
34	74.83	0.86
35	40.81	0.58
36	70.95	0.83
37	3.93	0.08
38	12.29	0.22
39	37.98	0.55
40	101.69	0.99

** Notes: As in table 3.*

Source: GIME calculations based on GUS statistics.

3. 4. The impact of integration with the European Union on the level of foreign direct investments

Between the beginning of 1990 and the middle of 2002 the accumulated value of foreign direct investment in the chemical industry amounted to approximately $1,450 million. That figure accounted for above 6 percent of the total foreign investment inflow to manufacturing industry. About 56 percent of that amount was invested in manufacture of miscellaneous chemical products, while the remaining 44 percent in manufacture of articles of rubber and of plastics. The list of major foreign investors in the chemical sector is presented in Table 5.

Table 5: Major foreign investors in the chemical sector

Activity	Major investors
Manufacture of washing preparations	Unilever NV, Cussons Group Ltd, Henkel EEC, Colgate Palmolive, Benckiser
Manufacture of cosmetics	Cussons Group Ltd, Beiersdorf, Oriflame, Bayer AG, L'Oreal S.A., Colgate Palmolive, Catzy of Poland
Manufacture of paints and varnishes	Alco Beckers AB, Kalon Group BV, MC ZOG Switzerland
Manufacture of rubber	Michelin, Goodyear France S.A., Bridgestone Corporation, Tokai Rabber Industries, Vorverk, Kaz Jackow
Manufacture of plastics and articles thereof	Nordisk Wavin A/S, Huhtamaki Van Leer, Graham Packaging, Plastic Omnium, ergon Meterie Plastische SpA, Plastiques Du Val de Lorie, Rolplasto, Inline Plastics Corporation, Pan Isolvit.

Source: „Boss Gospodarka".

Foreign direct investments play a significant role in modernisation and restructuring of the Polish chemical industry. This is of particular relevance providing fact that investments outlaying in the chemical sector do not correspond to its present development requirements. Furthermore, the value of investments in chemical industry has been declining for a couple of years now. In the first six months of 2002 it dropped by some 35 percent compared to the same period of the previous year, with the fall in manufacture of articles of rubber and plastics being much smaller than in the entire sector. In 2001, the scale of decline in investment was comparable. Similar downward trends have been for some time recorded in the entire Polish economy.

Nevertheless, some industries in the Polish chemical sector report both high foreign capital inflow figures and relative good investment ratios, compared to other industries. A relevant example is tyre industry, almost completely controlled by foreign parties, or the fast growing manufacture of plastic packaging.

Due to development reasons, the most sizable capital inflow will be required in the Heavy Chemical Industry sub-sector, equipped with the least advanced technology of all divisions of the sector, and by the same token showing the lowest competitiveness. The "Strategy for the chemical industry in Poland", adopted by the Council of Ministers in May 2002, assumes a sizeable rise in investment outlays in that segment[7]. Since this is medium-term strategy (until 2010), its implementation will be partly falling due for the early years of Poland's membership in the European Union.

Apart from public funds, own funds of companies, funds of Nafta Polska S.A. (a body implementing the „Strategy…"), bank credits, conversion of a part of indebtedness to banks into shares, bond issue facilities and European Union aid funds, the sources of programme's financing also envisage involvement of foreign investors, partly within the framework of the so-called offset package, associated with deliveries of military equipment for the Polish army.

[7] *Strategy for the chemical industry in Poland until 2010*, The Council of Ministers, June 4, 2002. The chapter devoted to its analysis presents the predicted costs of planned investments.

It seems, however, that the major proportion of foreign direct investments inflow to the chemical sector will be involved in a part of the „Strategy…" being associated with privatisation of Heavy Chemical Industry plants. Following the implementation of restructuring activities, financed with the above mentioned funds, the State Treasury is expected to gradually sell its majority stakes held in those companies. Commitment assumed by potential investors to implement appropriate investment packages is to be the key element of the privatisation process. In case of privatization with involvement of foreign investors, this should take a form of a multiplier mechanism, adding to the value of foreign direct investments originating directly from assets sale.

It is assumed that a substantial part of assets of the present Heavy Chemical Industry plants will be privatised with participation of foreign parties. Namely, it is mostly investors specialised in activities similar to those of privatised enterprises that are to be taken into account in the privatisation process. Furthermore, they have to display sufficient potential needed for securing long-term development. This includes, in particular:

- access to selling markets,
- funds for conducting research and for investment,
- an appropriate scale of operations,
- ability to integrate and co-operate effectively within one's own corporation.

Only then, financial investors, able to support the financial side of planned undertakings, will be allowed to participate in privatisation.

In the context of Poland approaching EU membership, implementation of the government "Strategy…" implies two principal issues. First, it seems that the higher the level of foreign investors' trust towards the consistency in introducing the proposed changes and in stability of regulations defining the institutional environment of investment, the better the chances for successful implementation of the "Strategy". The problem of the programme's credibility and conditions of its implementation seem to remain in the centre of attention. Hence the necessity of applying Community standards and procedures, by increasing credibility, has a highly positive impact on attracting foreign investment capital. For investors who have been operating on the Single European Market for many years, they are the „natural" environment for their activities. For investors from outside the Union meeting all requirements of alignment with Community regulations a compensation should be the opportunity of operating on the enlarged Union's market.

On the other hand, however, adoption of a restructuring strategy only a dozen or so months prior to Poland's accession to the European Union seems to be much delayed. The effect of increased foreign investment inflow associated with integration would be much stronger, if the Polish chemical industry already had a modern and stabilised structure. A separate issue is posed by chances for implementation of all the plans laid down in the „Strategy…".

3. 5. The impact of integration with the European Union on the labour market in the sector

The chemical sector in Poland is characterised by high overemployment. Comparing of the number of persons employed in chemical plants in Poland and in the European Union one can see that, in Poland productivity measured by the value of sold production per employee accounts for less than 29 percent of the same indicator in the EU-Fifteen.

Table 6 presents the Gdansk Institute for Market Economics estimates of labour productivity in particular segments of the chemical industry. Although the data relate to 1999, the differences have still remained substantial despite a noticeable increase in productivity of Polish industry in recent years.

Labour productivity variations across particular industries of the sector should be noted. The largest labour productivity gap against the European Union countries was recorded in *manufacture of other chemical products* (15.3 percent of the Union level in 1999), in *manufacture of man-made fibres* (18.3 percent of the Union level), and in *manufacture of basic chemicals* (20.4 percent of the Union level). The comparison was the most favourable for the *manufacture of paints and varnishes* (40.2 percent of the Union level) as well as for *manufacture of washing and cleaning agents and cosmetic and toilet preparations* (43.5 percent of the Union level), although even here discrepancies were extremely high.

Labour productivity of the entire sector, measured by value of sold production per employee, accounted for less than 29 percent of the average productivity in the European Union countries.

Table 6: Labour productivity in the chemical industry in the European Union and Poland in 1999

	European Union			Poland		
NACE*	Employment (thous.)	Production billion)	Labour productivity (€ (thousand €/employee)	Employment (thousand)	Production (€ billion)	Labour productivity (thousand €/employee)
241	565.4	172.16	304.49	38.4	2.38	61.97
242	28.3	8.59	303.50	1.9	0.19	98.00
243	154.3	26.80	173.69	5.5	0.38	69.73
245	224.4	47.00	209.45	21.9	2.00	91.20
246	168.8	37.82	224.05	6.7	0.23	34.36
247	60.3	11.75	194.93	6.6	0.23	35.69
251	293.8	34.63	117.88	19.9	0.80	40.37
252	917.4	119.67	130.44	49.4	2.01	40.74
Total	2 412.7	458.42	190.00	150.3	8.23	54.76

** For the list of NACE classes included in this report to the chemical sector see the Annex 2.*

Source: Compiled by GIME on the basis of Panorama of European Business 2000, Eurostat 2001, and GUS statistics.

The data and estimates presented above indicate that in connection with the expected progressive increase in labour costs after Poland's accession to the European Union the competitiveness of the Polish chemical

sector will be declining. Namely, dramatic labour productivity differentials are mostly the consequence of low labour costs and of application of obsolete production technologies. In Poland the rapid decline in competitiveness should be hampered by the acceleration of two parallel processes: technical modernisation of the existing plants and substantial restructuring of employment.

So far, the relatively lower labour costs than in the EU-Fifteen countries allowed to maintain ineffective allocation of production resources. The necessity of applying modern production technologies on a large scale will enforce considerable job losses in the sector. Hence, the expected growth of the sector is not likely to stimulate demand for labour. Just the contrary, it will be conditioned by a fall in the number of employed persons.

From the point of view of the labour market, the structure of employment in the sector is also relevant. Both on the global and European scale the chemical sector is a carrier of technological progress, and the level of its advancement is one of the measures of advancement of the entire economy. Hence, along with the necessity of substantial layoffs in the sector, demand for highly skilled employees may increase. The supply of highly skilled labour in this field may even prove insufficient in view of opportunities for employee migration and the expected modernisation and restructuring of the sector. It does not seem, however, that outflow of skilled labour may assume mass dimensions.

3. 6. The impact of integration with the European Union on regulations relating to the chemical sector

Materials hazardous for the natural environment, as well for human life and health account for a substantial share of products and semi-products manufactured by the chemical sector. Formation of toxic pollutants and wastes is one of the side effects of production processes. Due to this specific feature, the operation of the chemical sector is subject to numerous regulations concerning environmental protection and health and safety at work.

Among the problems associated with adjustment of the chemical sector to European Union standards, environmental protection issues and health and safety at work regulations are the most relevant ones.

Environmental protection

In the 1990s, a significant improvement of environmental protection standards was recorded in the Polish chemical industry. Over a decade, emissions of generated pollutants have been reduced considerably. Emissions of particulate matter per $1,000 of sold production of the sector have been cut to one tenth of the original level, gaseous emissions (excluding CO2) have been cut to one third, the amount of dumped wastes has been reduced to one third, and the amount of untreated sewage to less than one tenth of their original level. At present, the share of the chemical sector in pollution generated by the entire Polish industry accounts for approximately half of that sector's share in the sold production of industry.

Rapid decline in the emissions of pollutants was to a serious extent due to a partial departure from inefficient production processes applied under the former economic system, to closure of some plants being the worst polluters and to increased interest in environmental protection problems. Nevertheless the European Union, in accordance with the co-called sustained development concept, sets much more demanding requirements to be met by industrial plants.

Among many legal acts relating to environmental aspects of operation of the chemical industry in the context of Poland's integration with the European Union, the Environmental Protection Law8, implementing, among other things, the IPPC Directive (Council Directive 96/61/EEC), concerning integrated pollution prevention and control (IPPC), and application of Best Available Techniques (BAT) in industry, should be regarded as the most significant one.

The objective of Council Directive 96/61/EEC is to prevent or minimise emissions of pollutants to air, water and land originating from industrial installations. The Directive concerns industrial activity connected with serious environmental pollution, including chemical industry operation. The Directive provides for a specific industrial plant to choose the possibly best way of acting in order to attain a high degree of environmental protection taken as a whole (air, water and land).

In order to determine the requirements to be fulfilled by enterprises, the Directive applies the so-called Best Available Technique (BAT) concept. It means such an environmental protection technology, which ensures the best pollution abatement effect without incurring unbearable costs.

The Directive's implementation in Poland means adoption of new emission standards for the existing and planned industrial plants. Since the Polish chemical industry has been largely applying obsolete environmental protection technologies, which do not meet BAT standards, and the BAT definition itself virtually does not yet exist in Polish law, implementation of that Directive is bound to incur high costs. Since this problem relates primarily to already existing industrial plants, Poland has been granted a three – year transitional period to implement the Directive for the existing industrial plants. As for this category of plants the Directive comes into force at the end of 2007, the transitional period for Poland is to last until December 31, 2010.

Other legal act adjusting the chemical sector to EU environmental protection standards include the new law on wastes and the law on entrepreneurs' obligations in the field of management of certain wastes. It takes into account provisions of the Directive 94/62/EEC on packaging and packaging waste. It imposes upon entrepreneurs and obligation to provide for recovery and, in particular, recycling of their products' packaging. Articles of plastics account for a substantial and steadily growing share of this packaging.

Pursuant to the Directive, in order to attain the assumed ratio of recovery of materials from wastes it is necessary to establish national systems of return and gathering of used packaging and its multiple use and recovery, also including its recycling. For Poland, this means a necessity to develop a system of waste collection and sorting, as well as to build waste processing plants and incineration plants. Given the incurred costs, Poland has been granted in this field a five – year transitional period (by the end of 2007) to attain the 25 percent recovery ratio of plastic packaging waste assumed by the Directive.

In the field of air pollution emissions, the chemical sector has been recording a steady reduction of environmental nuisance. However, in the second half of 2002 the European Commission adopted a new directive introducing, as of 2005, more restrictive standards for emissions of sulphates, nitrates and particulate matter. In November 2002 Poland was granted a five-year transitional period for implementation of new, more restrictive standards. During that time power plants operated by Polish chemical works will be forced to embark on costly investment projects in order to meet these standards. An alternative to that may be the necessity to change the power generation method (e.g. to gas firing), or to close down own heat and power generating plants and to but electricity from outside providers. In both cases this will entail a substantial rise in production costs.

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[8] This is a framework law with delegations to other detailed legal acts, e.g. the law on wastes ,the law on transportation of dangerous substances, etc., which implements provisions of Community law relating to environmental protection.

In the field of the water/wastewater management the works on implementation of EU directives concerning discharge of hazardous substances into wastewater into the Polish law have indicated discrepancies in verification of hazardous substances subject to control in the EU Member States and in Poland. Only two out of 17 substances for which limits for discharge of pollutants into surface waters have been laid down in EU directives, are standardized in Poland. On the other hand, there is a large group substances standardized in Poland, which are not subject to control in the Union. Hence, the necessary adjustment to EU standards in this field will result in extra costs to be incurred by the sector.

The requirements for fulfilment of international environmental management standards, i.e. achievement of assumed economic goals coupled with observance of environmental protection provisions are regulated by the ISO 14000 standard. Being an international standard, it guarantees, inter alia, fulfilment of European Union requirements and cuts the environmental costs incurred by enterprises thanks to lower environmental use charges.

In June 2002 almost forty large chemical enterprises in Poland were in the course of implementing ISO 14000 standards. Among those firms, a dozen or so already had been granted certificates stating the existence of verified environmental management systems in accordance with ISO 14000 standards. However, an important issue of chemical sector plants, for which the fulfilment of ISO 14000 standards is not feasible due to high costs involved with their implementation. Although holding a certificate is not obligatory, the fact that only very few enterprises have obtained it is an indication of underinvestment on the one hand, and technological underdevelopment of the sector, on the other.

Health and safety at work regulations

Due to specific features of the chemical industry operation, a significant part of materials used and produced in that sector (i.e. raw materials, semi-products and products) is constituted by substances posing threat to human health and life. In production plants utilising particularly big quantities of hazardous materials (toxic, flammable, caustic and explosive ones) there are also threats involved with the release of these substances to the environment. Both mentioned groups of hazards have two major sources of origin. The first of them are the physical conditions, i.e. the installations and equipment used, while the other one is the human factor dependent e.g. on the level of employee skills.

The international programme of „**Responsible Care**", known in Poland under the name „***Odpowiedzialność i Troska*" provides for implementation of solutions aimed at** minimization of the threats mentioned above**. The** „**Responsible Care"** programme unites chemical companies in 46 countries, accounting for above 87 percent of world chemical production. The Programme assumes voluntary commitment of the enterprises involved in the continuous improvement of their activities covering the areas of environmental protection, healthcare and safety (the so-called EHS triad – *Environment, Health, Safety*). Meeting the criteria for participation in the programme can be regarded as equivalent to fulfilling EHS requirements set by the European Union. At present, the group of entities participating in the „***Odpowiedzialność i Troska*" programme covers 32 enterprises and that number is increasing steadily. It should be pointed out that these are mostly large companies, with a sizeable share of the chemical sector employment and production.**

In the European law there is a well-developed system of regulations relating to healthcare, and health and safety at work**. The Council Directive 89/391/EEC of 12 June 1989 on the introduction of measures to encourage improvements in health and safety at work is of crucial importance in this system. This is the so-called framework Directive, on the basis of which more than 30 directives providing for health and safety at work regulations have been issued. Among these directives the following ones are most relevant for the chemical industry:**

- Council Directive 89/656/EEC on the minimum health and safety requirements for the use by workers of personal protective equipment at workplace,
- Commission Directive 96/94/EEC on the protection of workers from exposure to chemical, physical and biological agents,
- Council Directive 98/24/EEC on the protection of workers' health and safety from the risks related to chemical agents at work,
- Council Directive 88/379/EEC on the approximation of the laws, regulations and administrative provisions of the Member States relating to the classification, packaging and labelling of dangerous preparations.

Most of the solutions concerning health and safety at work regulations, laid down in the EU directives, have already been transposed into the Polish legislation. The alignment with specific requirements had continued since the mid-1990s. In accordance with the time schedule provided for by the National Programme of Preparations for Membership, the harmonisation process was completed in December 2002.

With reference to health and safety at work regulations in the chemical industry, Poland had applied for and was granted only one transitional period for implementing the EU legislation. It relates to the above mentioned Council Directive 89/656/EEC, the full implementation of which is scheduled by the end of 2005. The transitional period will concern exclusively the equipment used in enterprises prior to December 31, 2002.

3. 7. Expected market structure changes

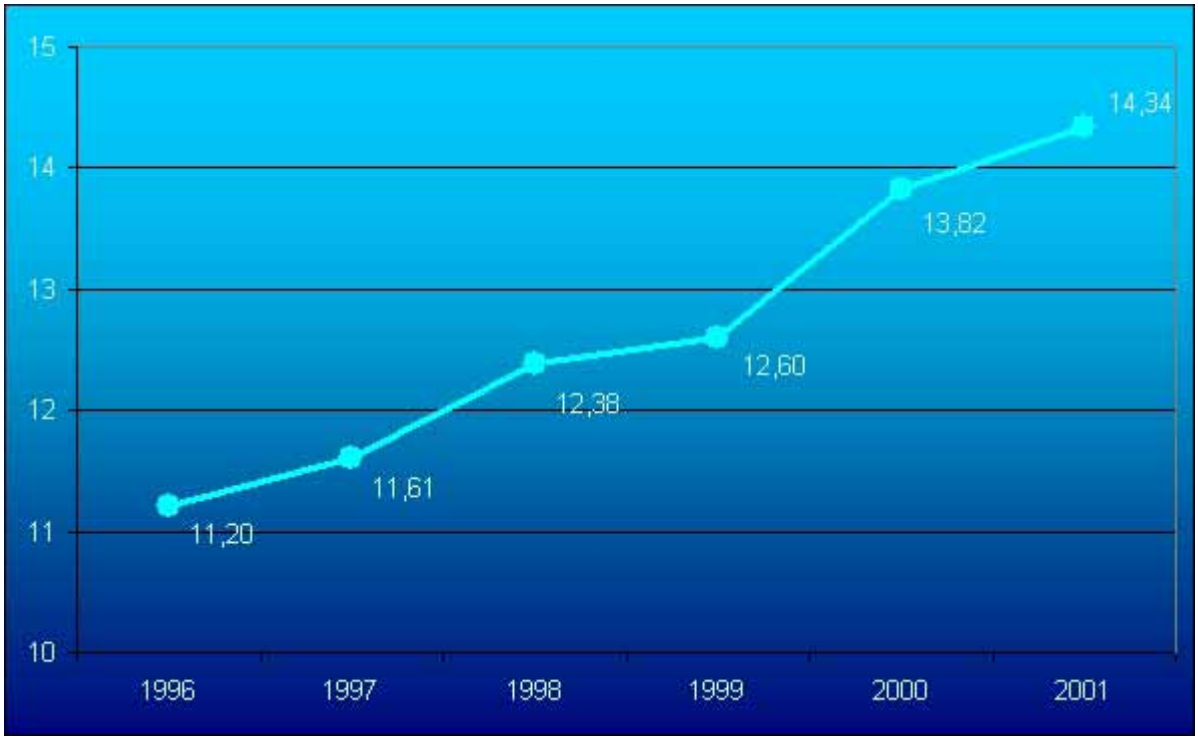
The Gdansk Institute for Market Economics has estimated the value (size) of the chemical sector market in Poland. It has been defined as the sum of sales revenues of enterprises operating in Poland, plus the value of imports, less the value of exports and plus (less) the change in inventories.

In 2001, the chemical market value amounted to above $14 billion. Compared to 2000, that meant a rise by 3.7 percent. Nevertheless, this increase resulted only in the zloty appreciation against the US dollar, as the chemical market value expressed in Polish zlotys declined by 2.4 percent in 2001 in contrast to 2000.

In the entire 1996 – 2001 period the chemical market value expressed in Polish zlotys rose by 94 percent, and that expressed in dollars by 28 percent. However, the rate of change of the market size expressed in dollars is definitely a more reliable measure given the stronger depreciation of the zloty than that of the dollar in 1995 – 2000.

Chart 6: Chemical products market size in Poland in 1996 – 2001

($ billion, current prices)



Source: GIME calculations based on GUS statistics.

To increase the share of Polish operators in the domestic chemical market fast restructuring would be required, both in particular enterprises and in the entire system of links among them and in the market structure.

In the world chemical industry the processes of production consolidation and concentration, as well as globalisation of chemical companies and market have been continuing for years. The arena is dominated by two main processes, namely capital and technology transfer to countries well-endowed with cheap production factors and resources, and a trend towards the enrichment of the existing production structures with processes of advanced processing basic chemicals into higher value added products.

In Europe, being the largest manufacturer of chemical products in the world and accounting for some one third of the world chemical production, some 70 percent of production capacities are distributed among Germany, France, the Netherlands, the United Kingdom and Italy. The remaining countries of Western Europe own approximately 20 percent of the European Union production capacities, and the countries of Central and Eastern Europe for the remaining 10 percent.

In the European Union 8 percent of the largest enterprises of the sector account for more than 80 percent of the total production value. Hence, the domination of these operators is undeniable. In processing industries and in industries producing final goods small and medium-sized enterprises have a dominating position, but they rely on big producers as far as supplies of raw materials and semi-products are concerned.

Effective development opportunities for the small and medium-sized chemical enterprises sector are secured thanks to well-developed industrial infrastructure, well-organised logistics and a reliable distribution network. Apart from that, these companies are supported by the systems of preferences, credits, subsidies and other instruments of the EU industrial and regional policy.

In Poland, apart from the small and medium-sized enterprises sector and the sector of companies with foreign capital, being relatively big in Polish terms, there is also the sector of large state-owned enterprises, dealing mostly with production of basic chemicals and fertilizers. Adjustment of the last group to global trends in the field of market structure development is to be facilitated by the already mentioned, government strategy for development of the chemical industry.

According to its assumptions, the consolidation of entities owned by the State Treasury will be mostly of a commodity nature. Vertical integration, or concentration based on specialised chemicals does not seem to be justified in Poland's conditions. Consolidation is to be followed by privatisation with participation of strategic investors involved in the chemical industry. Thanks to their resources as well as the scope and scale of their activities they are to ensure accelerated development of entities to be taken over.

Some of the plants of the sector, which are still controlled by the State Treasury, and are ruuning small-scale production as assessed by global standards, are scheduled to undergo vertical consolidation (e.g. with raw material supplies). These are entities dealing with manufacture of products such as titanium white, glue resins, or with PVC processing.

The concept of establishing the so-called Industrial Parks is an interesting solution, which might improve the conditions for operation of the small and medium-sized enterprises sector. Industrial Parks will be separate areas making use of local infrastructure to allow them to take up strictly defined economic activity. They are intended to contribute to restructuring the use of resources and to development of economic activity and investment in the region. This is to facilitate taking up business activities by new operators in the sector, as well as maintaining the existing production infrastructure in a condition allowing for its further use.

Industrial Parks are to be established on the basis of assets inherited from Heavy Chemical Industry plants, following their restructuring. These assets include, first of all, developed industrial areas and specialist infrastructure with power plants and skilled labour. They are intended to provide industrial services for operation of the already existing and newly-established enterprises of the sector. Hence, Industrial Parks will support implementation of the programme of attracting new investors and creating new jobs to replace those lost due to restructuring.

Industrial Parks are envisaged to remain for the relatively longest time under State Treasury and local authorities' control. From the point of view of investors interested in conducting activities there such a legal status might contribute to confidence building through securing reliable and stable guarantees of access to the Parks' infrastructure. In the long-term perspective, investors might acquire rights to buying Industrial Parks' shares.

3. 8. Sector policy of the government towards the chemical industry

Polish Heavy Chemical Industry plants, providing a foundation for the entire chemical sector, are characterised by inadequate capacities, given the domestic demand. On the other hand, the existing manufacturing potential is unable to cope with foreign competition, largely due to the use of obsolete technologies. As a consequence, the revenues per employee obtained by the Polish chemical industry are many times lower than those of European companies.

One of the reasons for that is the fact that no effective enterprise restructuring and privatisation schemes have been carried out so far. Any attempts taken up in the past were only of formal nature. Affiliates, totally dependent on the parent company, were established on the basis of big enterprises. Employment restructuring did not follow, and employees would still perform the same duties in formally different entities. The wrong and obsolete structure of the entire sector, unable to meet basic requirements of effective competition on the more and more liberalized chemical products market, has remained virtually unchanged.

The basic reasons for failure of the restructuring attempts to date are the following:

- wrong product structure of particular plants,
- overemployment,
- the prices offered by potential investors falling short of the State Treasury's expectations,
- excessive social package demands put forward by trade unions,
- investors' interest being only limited to separate, profit-making parts of enterprises.

On June 4, 2002 the Council of Ministers adopted the „Strategy for the chemical industry in Poland until 2010". The Strategy's basic objective is the „establishment of new economic entities, characterized by strong market position, stable finances, and good development prospects, on the basis of particular plants of the sector [still remaining under State Treasury control]"[9].

The sector's consolidation will be of a commodity nature. An optimal network of product, technological and ownership links is to be established for the new entities. At the same time enterprises will also be involved covering all stages of production, starting with raw and base materials, through various stages and forms of production, and ending with trade and marketing. Finally, there will be also firm focused on a single product market. Additionally, conditions are to be provided for development of small and medium-sized enterprises (SMEs), co-operating with big firms. This is to facilitate the absorption of the labour force laid off from the restructured plants. Moreover, global experience shows that such a model provides a foundation for effective development of the chemical industry. It should be remembered, however, that big entities face much better chances for obtaining financial support from the EU accession funds.

Two implementation stages are envisaged for the analysed „Strategy…". The first one will provide for restructuring and privatisation of the sector; and the other one for a reduction of trade deficit in basic chemicals and plastics through an effective investment programme. Nafta Polska S.A. is to play a co-ordinating and supporting role in this programme. To this end, the Ministry of Treasury is to empower Nafta Polska S.A. to act as proxy to rights from shares ownership of companies covered by the programme[10]. All the responsibilities of Nafta Polska S.A. include both detailed planning and carrying out restructuring and product and market consolidation, as well as privatisation.

Provisional estimates for implementation costs of activities scheduled for the first stage of the programme put that amount at PLN 65 million over the period of 2002 – 2007. Some PLN 25 million worth of those funds are to be disbursed by the end of 2003. Most funds are to be spent on upgrading the existing installations in order to enhance production capacities and to cut unit costs of production. A substantial share of funds will also be spent on the establishment of infrastructure parks. In the long run, the engaged state budget resources (a special fund administered by the Ministry of Treasury is to be set up) are to be returned in case of successful implementation of the „Strategy…", in a form of taxes and privatisation revenues. Nevertheless, a major part of the programme's financing is to be contributed from non-budget sources. The other sources of funding include: enterprises' own resources, contributions from investors, credits, local governments' budgets, and EU funds.

Implementation costs of the second stage of the „Strategy…", aimed at cutting the trade deficit in chemical products through expansion of domestic production capacities, are roughly estimated at some PLN 33

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[9] *Strategy for the chemical industry in Poland until 2010*, The Council of Ministers, June 4, 2002.

[10] Including, e.g.. Zakłady Azotowe Puławy S.A., Zakłady Azotowe Kędzierzyn S.A., Zakłady Azotowe w Tarnowie-Mościcach S.A., Zakłady Chemiczne Police S.A., Zakłady Chemiczne Organika – Sarzyna S.A.

billion in the years 2002 – 2010. For comparison, in 1995 – 1999, the average investment spending on the chemical industry amounted to $1.5 billion in Spain, $3.4 billion in France, and $6.9 billion in Germany.

Summing up the government Strategy's analysis it should be noticed that this is, for the time being, initial and rather vague. Detailed restructuring and privatisation plans are being prepared by Nafta Polska S.A., and their contents will allow to assess precisely the costs and advantages involved, along with chances for its full implementation.

Undoubtedly, restructuring and privatisation of the sector is an obvious necessity, conditioning further activities of the chemical sector in Poland. Nevertheless, experience has shown that implementation of big governmental projects often considerably diverts from original assumptions. It also seems that the adoption of a comprehensive „Strategy…" is already delayed, in particular taking into account Poland's approaching membership in the European Union structure, and the possible intensification of the competitive pressure as a consequence of that. On the other hand, however, the inflow of funds associated with the integration in the form of both an increase in foreign direct investment inflow, and structural funds inflow, is to contribute to improved conditions for the implementation process.

4. Summary

Like the entire Polish economy, the Polish chemical industry is currently facing one of the most difficult challenges in its history. Transformations, which are going on in this sector at present and are bound to continue in the coming period, will most probably determine its shape for many years. Integration with the European Union will provide a great opportunity for introducting world standards in the field of structural, technological and environmental solutions.

Solutions in the field of structural transformations have been proposed by the government in the sector's development Strategy. Its successful implementation, especially in the part relating to privatisation, largely depends on the interest of foreign investors. By eliminating the last remaining barriers to capital flows, Poland's membership in the European Union, will simultaneously diminish the degree of uncertainty associated with investing in Poland.

Increased capital inflow as well as consolidation and restructuring processes should find their reflection in the inflow of state-of-the art technologies and *know – how* to the sector. The efficiency of allocation of production factors should improve. This will be involved with deep transformations on the labour market resulting, inter alia, in considerable job losses in the sector.

The necessity of implementing the EU regulations will also enforce specific adjustments in the field of environmental protection. The progress which has been recorded in Poland in this area since the start of systemic transformation, also concerning the chemical industry, is considerable but inadequate from the point of view of Commodity regulations. However, costs involved with implementation of the most demanding EU directives will be spread over a number of years thanks to transitional periods, which have been negotiated by Poland.

Summing up, it should be stated that integration with the European Union is likely to pose any serious threats for the chemical sector in Poland. Just the contrary, it is rather possible to revive its growth. One should bear in mind, however, that the integration is an unprecedented process. As a result, it is extremely difficult to determine all the factors involved with it. The element of uncertainty, being quite common in the economy, cannot be fully eliminated.

SWOT analysis

The SWOT analysis concerns the chemical sector as a whole (within the limits adopted in the report). There are specific conditions for particular segments, which may divert considerably from the average for the entire sector.

Strengths	Weaknesses
relatively low labour costs, growing degree of alignment with the European environmental standards, high level of health and safety at work, consistent with the European standards, elaboration of a comprehensive programme of development, restructuring and privatisation of the sector.	product structure not adjusted to market demand, obsolete production technology and techniques, overemployment, significantly lower labour productivity than in the EU countries , incomplete restructuring of public sector enterprises, stalled privatisation.

Opportunities	Threats
liberalisation of the market of raw materials for Heavy Chemical Industry, better opportunities for establishment of international holdings in view of global consolidation trends, increased foreign investment inflow, inflow of the EU funds for infrastructure development and environmental protection, reduction of transaction costs and improvement of competitiveness in connection with expected introduction of the euro into circulation.	urgent need for taking up costly environmental investments, possible outflow of skilled labour force after the accession, mounting competitive pressure from the EU companies.

References

Czarny E., *Międzynarodowy handel wewnątrzgałęziowy jako przedmiot badań ekonomistów*, Bank i Kredyt, No 1 – 2 2000.

Lista 500, Gazeta Bankowa , April 23, 2002.

Kotyński J. (ed.): *Korzyści i koszty członkostwa Polski w Unii Europejskiej*, vol. 3, Foreign Trade Research Institute, Warsaw 2000.

Misala J., Pluciński M.: *Handel wewnątrzgałęziowy między Polską a Unią Europejską*, Warsaw School of Economics, Warsaw 2000.

Ocena sytuacji ekonomiczno – finansowej przemysłu chemicznego w I półroczu 2002 roku, Ministry of Economy, Warsaw, November 2002.

Przemysł chemiczny w świetle dostosowań do integracji z Unią Europejską, Gdansk Institute for Market Economics, Warsaw, November 2002.

Strategia dla przemysłu chemicznego w Polsce do roku 2010, The Council of Ministers, Warsaw, June 4, 2002.

Zarzycki M.: *Obroty wyrobami przemysłu chemicznego z zagranicą w latach 1998 – 2001*, in: *Boss Gospodarka* nr 43/2001 (406).

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Annex 1: Key chemical companies in Poland

No.	Rank on the "Top 500 List"	Company	NACE	Property[1)]	Revenue (PLN million)	Gross profit (PLN million)	Net profit (PLN million)	Number of employed persons
1	49	Unilever Polska SA Warszawa[2)]	2451	Foreign	2 250,0	n.a.	n.a.	2 400
2	52	Procter & Gamble Operations Polska sp. z o.o. Warszawa	2452	Foreign	2 162,8	n.a.	n.a.	1 064
3	81	Stomil Olsztyn SA	2511	Foreign, private	1 331,0	156,7	106,5	n.a.
4	94	Zakłady Chemiczna Police SA	2415	State	1 190,1	n.a.	n.a.	3 079
5	98	Zakłady Azotowe Puławy SA	2415	State	1 181,6	-119,7	-114,8	3 416
6	102	Anwil SA Włocławek	2416	Private	1 141,6	27,7	18,9	1 528
7	110	Dębica SA	2511	Foreign, private	1 068,5	109,2	77,9	3 309
8	123	Avon Operations Polska sp. z o.o. Garwolin	2452	Foreign	964,5	89,2	62,0	2 715
9	127	Henkel Polska SA Warszawa	2451	Foreign, private	932,1	75,4	50,5	1 022
10	129	Zakłady Azotowe Kędzierzyn SA	2415	State	916,2	-46,7	-46,7	1 800
11	143	Zakłady Azotowe w Tarnowie-Mościcach SA	2414	State	837,0	-74,6	-29,2	2 679
12	155	Dwory SA Oświęcim	2416	Private, state	758,8	13,0	12,2	1 695
13	158	Zachem Bydgoszcz	2414	State	743,1	-25,5	-25,7	1 519
14	184	Polifarb Cieszyn-Wrocław SA Wrocław	2430	Foreign, private	633,8	28,0	15,0	1 348

15	189	Elana SA Toruń	2470	Private	596,3	13,6	14,5	2 332
16	213	Rokita SA GK Brzeg Dolny	2414	Private	504,7	4,0	1,0	1 415
17	284	Soda Mątwy SA Inowrocław	2413	State, private	332,5	2,2	3,3	676
18	292	Aluplast sp. z o.o. Poznań	2523	Private	323,5	16,3	12,0	111
19	330	Wavin Metalplast - Buk sp. z o.o.	2523	Foreign	275,0	15,9	11,3	363
20	338	Organika - Sarzyna SA Nowa Sarzyna	2420	State	269,1	9,5	6,2	767
21	350	Inco-Veritas SA Warszawa	2451	Private	257,9	12,9	11,6	1 881
22	377	Curver Poland SA Słupsk	2524	Foreign	223,6	14,3	5,6	680
23	388	Stomil Sanok SA	2510	Private	208,1	17,2	12,6	n.a.
24	415	Zakłady Chemiczne Alwernia SA	2413	Private	175,3	-26,5	-23,6	413
25	435	Lentex SA Lubliniec	2523	Private	160,6	6,5	4,7	812
26	464	Sempertrans Bełchatów SA Rogowiec	2513	Private	140,7	14,3	10,2	285
27	471	Boryszew SA Sochaczew	2466	Private	137,4	16,4	12,8	608
28	477	Fosfory sp. z o.o. Gdańsk	2415	State, private	130,8	5,4	4,1	367
29	491	Zakłady Chemiczne Luboń SA	2415	Private	119,6	8,5	5,8	268
30	492	Messer Polska sp. z o.o. Chorzów	2411	Foreign	119,5	7,2	5,2	279

1) In case of a mixed ownership status, the first word specifies the dominant form.

2) Unilever declares manufacture of soap and detergents, cleaning and polishing preparations *as the main field of its activities. Nevertheless, it is only a part of its production profile.*

Source: Lista 500, Gazeta Bankowa, April 22, 2003.

Annex 2 : The chemical sector in the NACE Classification[11]

24.1 Manufacture of basic chemicals

24.11 Manufacture of industrial gases

24.12 Manufacture of dyes and pigments

24.13 Manufacture of other inorganic basic chemicals

24.14 Manufacture of other organic basic chemicals

24.15 Manufacture of fertilizers and nitrogen compounds

24.16 Manufacture of plastics in primary forms

24.17 Manufacture of synthetic rubber in primary forms

24.2 Manufacture of pesticides and other agro-chemical products

24.20 Manufacture of pesticides and other agro-chemical products

24.3 Manufacture of paints and varnishes

24.30 Manufacture of paints, varnishes and similar coatings, printing ink and mastics

24.5 Manufacture of soap and detergents, cleaning and polishing preparations, perfumes and toilet preparations

24.51 Manufacture of soap and detergents, cleaning and polishing preparations

24.52 Manufacture of perfumes and toilet preparations

24.6 Manufacture of other chemical products

24.61 Manufacture of explosives

24.62 Manufacture of glues and gelatines

24.63 Manufacture of essential oils

24.64 Manufacture of photographic chemical material

24.65 Manufacture of prepared unrecorded media

24.66 Manufacture of other chemical products n.e.c.

24.7 Manufacture of man-made fibres

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[11] The Annex 2 contains only NACE groups and classes covered by analysis in this report.

24.70 Manufacture of man-made fibres

25.1 Manufacture of rubber products

25.11 Manufacture of rubber tyres and tubes

25.12 Retreading and rebuilding of rubber tyres

25.13 Manufacture of other rubber products

25.2 Manufacture of plastic products

25.21 Manufacture of plastic plates, sheets, tubes and profiles

25.22 Manufacture of plastic packing goods

25.23 Manufacture of builders' ware of plastic

25.24 Manufacture of other plastic products