IMPLEMENTATION OF REACH IN THE NEW MEMBER STATES

Part Two
BUSINESS CASE STUDIES IN SELECTED NEW MEMBER STATES

July 2005

Editors:
IPTS

Authors:
Fraunhofer ISI, Germany (Operating Agent)
Progress and Business Foundation, Poland
Mr. Ralf Nordbeck, Consultant, Austria
IPTS, Spain

With contributions from:
Baltic Environmental Forum BEF, Latvia
Ökopol, Germany

European Commission

Joint Research Centre (DG JRC)

Institute for Prospective Technological Studies

http://www.jrc.es

Legal notice

Table of Contents

A. ABBREVIATIONS

Acquis	Acquis Communautaire
CEFIC	Conseil Européen de l'Industrie Chimique (European Chemical Industry Council)
CEFTA	Central Europe free trade agreement (Bulgaria, Czech Republic, Hungary, Poland, Romania, Slovakia, Slovenia)
CMR -	Carcinogenic, Mutagenic and Reprotoxic
CSR -	Chemical Safety Report
CZ	Czech Republic
CZK	Czech Koruna
DU	downstream user
EE	Estonia
EEC	European Economic Community
EMAS	eco-management and audit scheme
EU	European Union including the 10 New Member Sates
EU-15	European Union with the 15 member states before 1 May 2004
EU-15	European Union with the member states before 1 Mai 2004
ECB	European Chemicals Bureau
EU	European Union
EINECS	European Inventory of Existing Commercial Substances
F	formulator of preparations
GDP	gross domestic product
GZS	Chemical Industries Association of the Chamber of Commerce and Industry of Slovenia
GLP-	Good Laboratory Practice
HPV	high production volume
HSE	health, safety and environment
IA	Impact Assessment
IA	impact analysis
IHCP	Institute for Health and Consumer Protection of DG JRC

IPPC	integrated pollution prevention and control
JRC	Joint Research Centre of the European Commission
LPV	low production volume
M/I	manufacturer and importer of substances
Mio.	million
ME	Ministry of the Environment
NaOH	sodium hydroxide (caustic soda)
NACE	Nomenclature statistique des activités économiques dans la Communauté européenne
NGO	non governmental organisation
NPV	net present value
NMS	New Member States (of the European Union)
OHSAS	occupational health and safety assessment series
OSOR	One Substance One Registration
PL	Poland
PLN	Polish Zloty
PTB	Persistent, Toxic and Bioaccumulative
QSAR	Quantitative Structure-Activity Relationship
R&D	Research and development
RoW	rest of the world
RPA	Risk & Policy Analysts Ltd., London
REACH –	Registration, Evaluation, and Authorisation of Chemicals
RIS	REACH impact studies
SDS	Safety Data Sheet
SIEF	Substance Information Exchange Forum
SME	Small and Medium Enterprise
SCHP	Association of Chemical Industry of the Czech Republic
SU	Soviet Union
UNICE	Union des Industries de la Communauté européenne

VCI	Verband der chemischen Industrie
VPVB	Very Persistent and Very Bioaccumulative
VOC	volatile organic compounds

B. BACKGROUND, OBJECTIVES AND APPROACH

Background

This study was carried out under the Memorandum of Understanding (MoU) between the European Commission and industry (UNICE/CEFIC) concerning the complementary work for the Impact Assessment of REACH.

According to the Memorandum of Understanding, three areas for further analysis were identified:

- Analysis of the potential impacts of REACH on business throughout the supply chain
- Analysis of the potential impacts of REACH on innovation.
- Analysis of the potential impacts of REACH on New Member States

Under the framework of the MoU, a Working Group, chaired by the Commission was created to monitor the progress of the studies. The Working Group consists of representatives of industry, trade unions, as well as environmental and consumer NGOs.

The DG JRC/IPTS has contributed to the analysis of the potential impacts of REACH in the New Member States with two studies: I) Overview of the chemical and specialty chemical sector in the New Member States, which is presented in Part one of this report; II) Business case studies in selected New Member states, of which the findings are presented in this document, part two of the report.

Objectives

The objective of the business case studies was to provide illustrative examples of the ability of the individual companies in the NMS in dealing with the new chemicals regulation. This ability was examined from different angles: From the economic aspect, the impact on costs and prices was analysed, substance withdrawal, administrative impact, capacity needs and the competitiveness on European and international markets. From the technological point of view the impact of REACH on innovation, replacement of substances and process adaptation was examined. The strategic analysis looked at alternatives to cope with REACH (such as the import of components, relocation to non-EU countries etc.), the potential of companies to adapt to the changing legal framework (including the implementation of the environmental acquis) and the relative importance of REACH amongst different drivers for change. All the findings of this second part of the IPTS study are exclusively based on the information provided in a limited number of interviews with chemical companies in selected new member countries. In some cases the results address the issue concerning low volume substances or specific market conditions under which REACH has to be implemented, therefore all the results should be interpreted in the right context and should not be used for generalisations of any kind for the chemical sector of individual country or for the entire economy.

Approach

For the illustrative case studies, which are summarised in this document, the specialty chemicals sector was chosen in agreement with the CEFIC and UNICE in the context of the Working Group, which is set up under the framework of the MoU and consists of all the major stakeholders. Companies in this sector usually handle large numbers of substances, often in lower volume than basic chemicals, which are developed in close co-operation with their customers, and are by nature rather innovative. As the objective of this report was to identify potential impacts of REACH on the chemical sector in the New Member States, it seemed most appropriate to concentrate the analysis on the specialty chemicals sub-sector.

In discussion with CEFIC and representatives from all CEFIC member associations in the New Member States, Poland, the Czech Republic agreed to participate in the case study part of this exercise, as the share of the chemicals sector in overall manufacturing as well as the size of the specialty chemicals sub-sector in these countries were identified as being appropriate for the envisaged analysis. At a later stage an agreement with Estonian public authorities and the chemical industry association was achieved to include this country in the analysis, following the same methodology as previously agreed with the other two countries.

The methodology comprised the horizontal analysis of the specialty chemical sector in the selected countries through desk research, interviews with the respective national CEFIC member associations and with a number of formulators of specialty chemical preparations. This analysis should be complemented by one vertical value chain analysis per country, to be defined in co-operation with the companies and industry associations.

The selection and contact of companies in Poland and the Czech Republic was done by chemical industry associations at European and national level. Two companies were mediated by Eurocommerce and DUCC, both being members of the Working Group. The companies in Estonia were chosen by the Estonian ministry of economic affairs and communication, in co-ordination with the national chemical industry association. The resulting sample of companies included manufacturers and importers of substances as well as formulators. No downstream users were identified, as none of the participating enterprises agreed to establish contacts to their customers in the frame of this exercise. The respective national chemical industry associations encountered serious difficulties in identifying a representative sample of companies in the specialty chemical sector. The main reasons are the low number of companies, in particular SMEs, represented by the association and the limited willingness of companies to provide sensitive business information for this exercise. As a consequence, the sample did not allow establishing a consistent value chain in any of the participating countries. Subsequently, the methodology had to be adapted in the way that unavailable data at the level of substance producers, which were necessary to calculate the cost pass through along the value chain, were bridged through information and expert judgements from formulators.

All companies were interviewed on the basis of a standardised questionnaire. Questions addressed the issues of competitiveness, innovation, HSE management, product portfolio development, and impacts from accession to the EU.

The preparations and substances selected for further analysis under the methodology agreed in the Working Group were exclusively chosen by the participating companies, according to the criteria provided to them to identify the appropriate specialty chemicals preparations and/or substances. Although no value chain for individual substances could be constructed from supplier to downstream user level, vulnerability of substances and subsequent impacts for formulators could be analysed in all countries.

The finings from the case studies have been subjected to a process of verification and validation. The verification report drafted by an independent expert concluded that the findings are based on sufficiently transparent evidence from the companies interviewed. The validation confirmed that the information provided to the DG JRC/IPTS by the companies was accurately reflected in the assessment. The comments and suggestions received in these processes have been taken into accounted in this final report.

C. SUMMARY

C.1 Specialty Chemicals

In general, NMS, in comparison to the EU-15, have less specialised production of fine and specialty chemicals and account for a relatively small share in the value added of the chemical industry. In this respect, the impact of REACH is expected to be relatively less important in the NMS. However, since many producers of the non-basic chemicals in NMS do not have the scale of production and a relatively secure market position as being the case for their counterparts in EU15, they could face more difficulties and be more sensitive to REACH.

A detailed examination of the specialty chemicals sector has been carried out in the three selected countries for the case study, i.e. the Czech Republic, Poland and Estonia. The evolution of the sub-sector appears to be similar in the Czech Republic and Poland. In terms of turnover the specialty chemicals production has grown much faster than the chemical sector as a whole and such growth has been even more pronounced in terms of value added. In comparison, specialty chemicals contribute 38% and 24% to the total turnover of the chemical industry in Poland and the Czech Republic respectively.

In both countries, export and import of specialty chemicals increased with export increase much faster than import. Despite this growth there is still a trade deficit in specialties in both countries that amounts to 27% of total chemicals trade deficit in the Czech Republic and to 23% in Poland.

Data show that the chemical sector and specialty chemicals in particular in Estonia have stagnated and there has been very slow development in production and productivity. The specialty chemicals sub sector takes a prominent position within the chemical industry (50% of sector's value added). Trade with eastern non-EU countries plays a dominant role in this country, especially for specialty chemicals (74% export to non EU countries).

Trade with non-EU countries may be particularly affected by REACH. Regarding imports, the need for registration of imported raw material and the potential lack of necessary information from the supplier might force the importers to switch to EU suppliers. Regarding exports, the price increases of chemicals after registration might lower their competitiveness on markets outside the EU. Thus, due to its much larger share of exports to non-EU countries and stronger reliance on raw material imports from outside the EU, Estonia may be more affected by the implementation of REACH.

C.2 Business case study in selected New Member States

While valuable information has been generated in the course of this work, considerable care has to be taken in evaluating the findings in order to avoid any broad-based conclusions in relation to the capacity or otherwise of the general body of enterprises in the new Member States to cope with REACH. In particular, the limitations of the exercise linked to the time constraints and the difficulty of identifying suitable firms willing and capable of early participation, the difficulties in pursuing a full supply chain analysis due to issues of confidentiality and which precluded the involvement of downstream users, and the particular characteristics of the participating firms which mainly produced high volume substances, do not allow these results to be regarded as representative of the experience in the new Member States.

C.2.1 Impact on competitiveness

The case studies carried out in this study included 15 companies. Amongst these were 7 manufacturers of substances, 2 importers, 5 formulators and 1 downstream user. As the data of

the downstream user entered the analysis at a very late stage, no thorough analysis could be carried out for this company.
Chemical companies interviewed and industry associations of the new member states fear that the implementation of REACH might increase the competitive pressure on them. The main concerns expressed by them are:

- Companies expect increasing cost through testing and registration, without being able to pass the costs on through of the supply chain.

- Some companies expressed the worry that potential withdrawal of substances under REACH would result in a reduced number of suppliers. This might lead to increased dominance of the remaining suppliers and consequently, price increases may exceed the actual REACH cost.

- According to the industry associations many SME, use large numbers of chemicals, often in low volumes, and serve profitable niche markets. These companies are considered to be vulnerable to REACH because they can not anticipate or avoid decisions from suppliers regarding substance withdrawal.

- One of the key concerns of the companies is the administrative efforts required by REACH. Companies, may have difficulties to find additional resources to implement REACH. According to industry associations this might be particularly a problem for SME: As their markets are small and competition is generally high, the formation of consortia, which is one of the important cost reduction measures envisaged in REACH, may not be easily achieved. On the other hand, branches of multinational companies, although classified as SMEs, are thought to be able to manage REACH.

- It is expressed that REACH might result in competitive advantages for EU15 companies and may eventually drive local companies out of business. This reflects the currently experienced competitive pressure from their EU15 counterparts.

In the frame of this study, for the 7 manufacturers, whose product portfolio comprises 419 substances, a vulnerability analysis was carried out, calculating NPV for 29 substances and price increase after REACH for 8 imported raw materials. The volume bands for these substances are as follows: 0-10 tons: 1 substances, 10-100 tons: 10 substances, 100-1000 tons: 5 substances, more than 1000 tons: 21 substances. One of these substances, with a negative NPV, resulted to be vulnerable. This one, a polymer, is used in one of the selected preparations. A further five[1] non-polymer substances were non-profitable in the data reporting year and hence regarded as vulnerable to REACH. For one company the one-off cost of registration represented 9.6% of the profits.

With regards to the 5 formulators, for 12 preparations, which were composed of 137 substances, vulnerability analysis based on NPV and price increase estimation was carried out. Substantial increases in raw material costs could be identified in a few cases. These cases lead to price increases between 0.03% and 2% for the 12 analyzed formulations in a full pass-through scenario. Additionally, sufficient suppliers for the analysed input substances are available, accordingly no raw material shortages can be expected. For some preparations a refreshment or reformulation of the product may become necessary. A preparation supplier was found to have significant impact on its profit margin, a decrease of 58% due to substance price increases.

Two importers were analysed in this study, whose import portfolio comprises 148 substances, out of which 102 are imported from eastern non-EU countries. Due to scarce data availability, an analysis of the product portfolio could only be carried out for the Estonian importer. Compared with the substance manufacturers and formulators, the company appears to be more

[1] Three in Estonia and two in Poland

affected by REACH. Analysed data show that REACH registration total one-off registration cost represents up to 80% of the company's total one year turnover. The extent of the effect could not be analysed in detail, however, a few important findings are worth to discuss. It was shown from the analysed sample that the raw material price level in eastern non EU countries is on average 35 % below the cost of material of EU origin. Under REACH, the importer would need to invest in registration in order to maintain its non-EU imports. The analysis showed that after registration under REACH less than 50% of the imported substances assessed from non-EU countries are still cheaper than those of EU origin, thus continuous trade of those substances can be maintained by the importer. The rest of the substance would have a higher price than that on the EU market, thus the importer may need to switch its supply to EU origin (price increase between 40% - 70%). In both cases the price is expected to increase with impacts on profit margins and, as whole, changes of the supply network may be expected.

No interviews with downstream user clients of the selected formulators were carried out in the context of this study.

C.2.2 Impacts on the product portfolio

In the quantitative analysis of the case studies only a small number of the 29 analyzed substances have been identified as vulnerable having a negative NPV. Whether production of these substances will be phased out under REACH by the individual manufacturing company will depend on the NPV criteria and other factors such as cost pass on and alternatives for cost reduction, e.g. entering consortia for registration and sharing of test results, which have not been analysed.

As mentioned, importers are expected to be affected more than manufacturers due to the fact they tend to have a broader range of products in the lower tonnage band. Their situation is aggravated by the fact that the suppliers of these substances might not be able to provide them with all information which is required for registration under REACH. This implies that REACH may result in importers modifying its product profile to limit the cost of registration, e.g. mainstreaming product portfolio. Consequently, this may reduce the number of suppliers per substance on the market.

C.2.3 Impacts on innovation

In the interviewed companies in Poland and the Czech Republic, the R&D budget stays far below 1 % of turnover. In the Estonian average companies spend around 2.7 %. Average in EU-15 is a share of 5 to 8 %, according to CEFIC.

The analysis of the case studies revealed that in a limited number of cases, prices for substances would substantially increase through REACH, in particular in the case of imported raw materials. However, raw material availability was in none of the cases endangered, though would be subject to substantial price increases of 40-60%.

However, it turns out that the capacity for R&D and innovation in the chemical sector as a whole is limited in the NMS when compared to the EU-15. In the single market, this is a strong competitive disadvantage in itself, and might also hamper the implementation of REACH.

C.2.4 Impacts on HSE management

The standard of the HSE management seems close to that of the EU-15. This was primarily a consequence of the implementation and enforcement of the Chemicals Acquis, which is fairly complete. All companies stated that neither big efforts nor excessive costs were necessary for compliance. IT aided management systems for bookkeeping and tracing of chemicals are quite common, although not 100% available. Company's units for the classification and labelling scheme of substances and preparations, as well as the management of SDS are well staffed.

Responsible staffs have to handle far lower numbers of SDS per person than in EU-15 companies.

Considering the cooperation along the supply chain of chemicals, the situation is similar to that of EU-15 companies. Support of downstream users of chemicals by the manufacturers of that preparation is business as usual. But regular contacts of substance suppliers with downstream users in the manufacturing sectors are rare. The establishment and maintenance of such cooperation, which is not driven by the operational business, is one of the new challenges coming up with REACH.

The number of testing laboratories is regarded as appropriate for the implementation of the current chemicals legislation. Nevertheless it can be foreseen that the need for testing of the phase-in substances under REACH cannot be met with the current number of GLP certified laboratories.

C.2.5 Ability of companies to cope with REACH

The analysis confirmed that the knowledge about REACH in the companies of the NMS is fragmentary. The priority for preparatory activities for REACH in the interviewed companies is low. The reason is not the lack of strategic foresight, but the lack of time and resources due to other more urgent challenges which they face, for example, the ongoing privatisation, the restructuring and modernisation of production, the efforts to comply with the Environmental Acquis, and the dramatically increasing competition with EU-15 companies after accession, which absorb much of the companies' management capacity. The question of relocation to other countries or withdrawal of processes and products was not an issue for any of the interviewed companies. Companies have not yet assessed impacts of REACH on their own company, nor have they developed strategies to cope with the foreseeable changes of the future chemical regulation regime. None of the interviewees were able to draw even a rough picture of company's approach to identify substance uses and to perform exposure assessments and risk characterisations at downstream users.

After implementation of the Chemicals Acquis, in principle the starting point for REACH implementation seems to be at a common level between EU-15 and NMS companies. But, the lack of experience, low innovation capacity, a general competitive disadvantage, combined with increasing competitive pressure from the EU-15, and the ongoing effort for implementing the heavy investment directives under the Environmental Acquis might be drawbacks for the implementation of REACH in the New Member States.

C.2.6 Business benefits of implementation of REACH

The designed benefits of REACH in terms of environment and health are generally acknowledged by the interviewed companies. Business benefits were thought to be possible by many but not considered important to the company and the accompanied administrative burden of REACH implementation is thought to outweigh the potential benefit. Out of the 13 visited manufacturers, ten companies recognise the need to improve information exchange along the value chain and half of them consider the implementation of REACH could benefit in this respect. Four companies, including all the interviewed manufacturers in Poland, do not see any benefit of REACH. The business benefits of REACH implementation are mostly thought to be better credibility and image of companies, as well as risk prevention though the availability of more detailed information on substances used in the production.

D. CASE STUDY – ILLUSTRATION OF REACH IMPACT IN THE SPECIALTY CHEMICAL SECTOR IN SELECTED NMS

D.1 Introduction

This study aims to illustrate the capacity of specialty chemical companies in the selected NMS to cope with REACH at the company level. Poland and the Czech Republic were chosen in agreement with Industry Associations, because of their chemicals sector's absolute and relative size and industrial structure. Estonia joined the project later as a third country for the case study. However, it should be taken into account that the NMS consist of a group of very heterogeneous countries, which have a different historic background, different size, different economic systems etc. These differences make it rather difficult to arrive at conclusions which are representative for all of these countries.

Apart from the agreed selection of countries it was also deemed necessary to limit the scope of the industrial sectors to be analyzed in order not to overstretch available time resources. With regards to this constraint it was decided to focus the analysis mainly on the specialty chemicals sector, as this might be, according to CEFIC/UNICE, one of the sub-sectors potentially most affected by REACH. Furthermore, an agreement was reached that the case study should take on the value chain approach, i.e. the impact of RAECH should be assessed through the entire supply chain of the chemical product rather than isolated analysis for suppliers, formulators and downstream users. This should make it possible to understand not only the vulnerability of an individual substance to REACH, but also the pass-on of the effects of REACH through the supply chains.

In this chapter, first, the definition of specialty chemicals is discussed to establish a common understanding of the scope and limits of the study. Second, in order to compare and cross examine the case studies in selected countries for their similarities and differences, the step by step approach of the study and methodology designed to analysis the empirical information and data are explained in detail. At last, the case studies are presented country by country. For the purpose of putting the case study and selected companies into perspective, the current situation of the specialty chemicals in the selected three countries was studied. Then, against this background, company analysis is discussed. Most of the empirical data and information provided by the companies are highly confidential, therefore, the evidences and, upon which, the conclusions drawn are summarised and aggregated to ensure that it is not possible to trace back the results to individual companies.

D.2 Specialty chemicals

It is considered rational to assume that substances of low price, or low volume or, all the more, a combination of the two expose both the substance and its preparation to a stronger risk that the investment in its registration as imposed by REACH will not pay within a reasonable pay-back period. One of the possible consequences is that such vulnerable substances or preparations may phase out and therefore have negative effects on their manufacturers as well as users. According to the chemical industry, such negative effects are most likely to be discovered in the group of specialty chemicals. However, as the definition of "specialty chemicals" is not universally established, it is necessary to discuss and clarify the meaning of these terms for the purpose of this study based on the definition of CEFIC and NACE category.

The term of specialty chemicals (substances or preparations) is commonly defined in distinction of basic chemicals in both volume and function. According to CEFIC, the European Chemical Industry Council, 'specialty chemicals' are manufactured in lower volumes than basic chemicals and are used for specific purpose such as functional ingredient or as processing aids in the manufacture if a diverse range of products. Data shows that specialty chemicals represent nearly one forth of the value of the total EU-15 chemical industry production (see *Table D1*).

Table D.1: Production of the European chemical industry (EU-15) in 2002 (CEFIC 2004)

	Production (billion EUR)	Share (%)
Commodities	255	71
Fine chemicals	23	6
Specialties	82	23
Total	**360**	**100**

Specialty chemicals are in widespread use in the entire manufacturing, construction and oil industry, in utilities, all kinds of crafts and they may be contained in end products. As shown in Table D 2, pigments, dyes, fillers, imaging chemicals, water and paper chemicals, surface specialty chemicals as well as surfactants are among the most important specialty chemicals. Although low volume in production is considered as a common feature of the speciality chemicals, this list indicates that some of them can be in fact large volume chemicals.

Table D.2 Production of specialty chemicals in the EU-15 in 2002(CEFIC 2004)

	Production (billion EUR)	Share (%)
Pigments, dyes, fillers	11.0	13.4
Imaging chemicals	10.0	12.2
Water and paper chemicals	8.0	9.8
Surface specialty chemicals	7.0	8.5
Oleochemicals and surfactants	6.0	7.3
Flavour and fragrances	4.2	5.1
Adhesives and sealants	4.0	4.9
Nutrition chemicals	4.0	4.9
Catalysts	3.5	4.3
Plastics and rubber additives	3.5	4.3
Cosmetic chemicals	3.0	3.7
Electronic chemicals	2.5	3.0
Textile chemicals	2.0	2.4
Others	13.3	16.2
Total	**82.0**	**100.0**

As their purpose being specific, specialties enable customers to reduce overall system costs, enhance product performance and optimise manufacturing processing through custom solutions. That is to say they are sold for what they do, rather than for what they contain. Basically, specialty chemical companies sell solutions to problems. A feature distinguishing specialties from basic chemicals is their large customer servicing or technical servicing component Therefore, it is argued that specialty chemical prices tend to be set by value-in-use, not by cost, and historically their earnings have not been impacted as much by demand pressures. In general, specialty chemicals represent a small portion of a customer's total cost but are essential to enhancing productivity or performance. … This raises switching costs and offsets the bargaining power of customers. … Traditionally, specialties have higher profit margins (and returns on equity) than basic industrial chemicals and a much lower degree of cyclicality. Earnings have been less volatile. (CEFIC 2004).

These characteristics of specialty chemicals have important implications for the relevance of registration costs imposed by REACH. On the one hand, the relatively high profit margin may allow the manufacturers or importers to bear at least part of the registration cost without a direct need to increase prices. On the other hand, the value-in-use character of these chemicals would make it easier to increase price.

Another fact relevant in the context of REACH is the large number of speciality chemicals and, correspondingly, their respectively low production volumes. RPA has collected information on the structure of the production volumes in the specialty chemicals sector (see *Table D.3*). This estimate indicates that registration cost per tonne of specialty chemical substances could be much higher than that of basic chemical substances.

Table D.3 Number and production volume range of selected chemical specialities (Source: RPA)

Specialty	**Number of substances**	**Volume range (t/a)**
Adhesives and sealants	> 5.000	1 – 100
Specialties coating	> 10.000	1 – 100
Dyes and pigments	2.500	unknown
Electronic chemicals	2.000	low
Leather	100 – 1.000	predominantly 1 – 100
Photographic	1.750	< 10
Biocides	900	1 – 100
Flavour and fragrances	> 3.000	< 50
Paper chemicals	2.300	1 – 1.000

In order to illustrate when production of a substance is in danger of being economically unattractive to the manufacturer due to the registration costs of REACH, *Table D.4* summarizes an estimation of the lower price limit of a substance in relation to different production volumes, in other words, below the limit price, the net present value (NPV) calculated by Equ. 1, is negative, i.e. the production of a substance would be no longer profitable. The NPV calculation is based on the average scenario of JRC/IHCP testing costs, and the assumption of a profit margin of 8%, a discount rate of 10% and a payback time of 5 years.

Table D.4 Minimum substance price for a profitable investment in registration under REACH

Production volume (t/a)	Lower price limit (EUR/kg)
1	43.70
10	27.00
100	7.20
1,000	0.90
10,000	0.09

Note: Production volumes are examples of actual quantities and do not relate to REACH-related tonnage bands.

According to CEFIC, the EU-15 specialty chemicals sector is made up of more than 10,000 companies, of which the large majority employ less than 250 persons and are thus by definition SMEs. This could be considered as an additional concern and reason for having a closer look at the specialty chemical sector insofar as the implementation of REACH is assumed to be more difficult for smaller companies.

However it should be kept in mind that the specialty sub-sector is extremely heterogeneous. The range of manufacturers includes very small companies with 5 employees as well as corporate groups with 10.000 employees and more. In most cases, companies have a mixed product portfolio, which also covers other than specialty chemicals. Even mixed functions of substance supplier and preparation maker within a single company were told to be quite common (GZS 2004).

In this study, overviews of the specialty chemicals are presented for three NMS, the Czech Republic, Estonia and Poland. However, little information and data collected can be analysed directly using the categorisation of CEFIC as discussed above. The official national and/or EU statistics available are usually based on the NACE classification system as shown in Table D.5**,** i.e. chemical industry covering NACE 24 and 25. In this study, as a solution to the lack of data

and information, the sub-sector of the specialty chemicals is analysed using the NACE system meanwhile keeping as close as possible to the CEFIC definition as discussed below.

Table D.5: NACE classification of activities in the chemical industry

24	**Manufacture of chemicals and chemical products**
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**
24.3	**Manufacture of paints, varnishes and similar coatings, printing ink and mastics**
24.4	**Manufacture of pharmaceuticals, medicinal chemicals and botanical products**
24.41	Manufacture of basic pharmaceutical products
24.42	Manufacture of pharmaceutical preparations
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**
25	**Manufacture of rubber and plastic products**
25.1	**Manufacture of rubber products**
25.2	**Manufacture of plastic products**

Comparing NACE and CEFIC categorisation, it would basically be desirable to specifically select figures from 4-digit NACE categories such as 24.12 (dyes and pigments), 24.52 (perfumes and toilet preparations), 24.64 (photographic chemicals) and so on. However, statistical data of this kind were not available. At 3-digit level, NACE figures are also not always available; but they provided a sufficient statistical basis for the comparative analysis undertaken for the three countries. However, such compromise may not provide an accurate picture of the specialty chemicals. Accordingly, owing to their general nature, NACE categories 24.1 (basic chemicals) and 24.7 (man-made fibres) were assumed not to contain specialty chemicals. Pharmaceuticals, medicinal chemicals and botanical products (NACE 24.4) and, to some extent, pesticides and agro-chemicals (NACE 24.2) could be assigned to specialty chemicals in principle, but will not be considered as such here, because they do not fall under the REACH regulation. Eventually, this leaves NACE categories 24.3, 24.5 and 24.6 being summarised as the basis of the analysis of the specialty chemicals in this study.

D.3 The approach and methodology of the case study

Given the defined objective of the case study, the following “endpoints” are considered to be the focus of each company analysis in illustrating the impacts of REACH on

1. *costs, profitability and competitiveness of companies,*
2. *company's product portfolio,*
3. *innovation activities and time to market of products,*
4. *the HSE management and*
5. *strategies to cope with REACH.*

As mentioned, since REACH is designed to control chemical substances on their entire way along the production chain from the manufacturer or importer to the applier, the interviews included suppliers of substances, formulators of chemical preparations and downstream users in the manufacturing sector. In order to collect the needed data and information, questionnaires were developed and since not all actors along the supply chain are affected by REACH in the same way, three questionnaires are differentiated for suppliers, formulators and downstream users.

D.3.1 Step by step approach

Formulators play the main role in the supply chain of the specialty chemicals, and they are, therefore, the starting point of the entire interview activities. Accordingly, for the empirical fieldwork five major steps were initially planned as the following:

1) Interviews with formulators

As starting point of this investigation interviews were made with formulators of preparations in each of the participating countries. One of the main aims is to identify with each of the formulators' the potentially vulnerable preparations. This set of vulnerable preparations form the basis for the value chain analysis to follow.

2) Selection of case studies

With the data gathered on a number of potentially vulnerable preparations, three preparations, one in each country, were selected for the vertical case study analysis. Preliminary selection criteria were:

- High degree of complementarity between the cases.
- Prospect of a limited number of relevant substance suppliers such to ensure the feasibility of the analysis within the time horizon of the project.
- Inclusion of downstream manufacturing sectors which are of importance for the respective national economy.

3) Preparation of interviews with substance suppliers and downstream users

Communications and discussion on selected preparations should be carried out with the relevant companies, so they could identify the substance suppliers and downstream users and organise the interviews to follow.

4) Interviews with substance suppliers

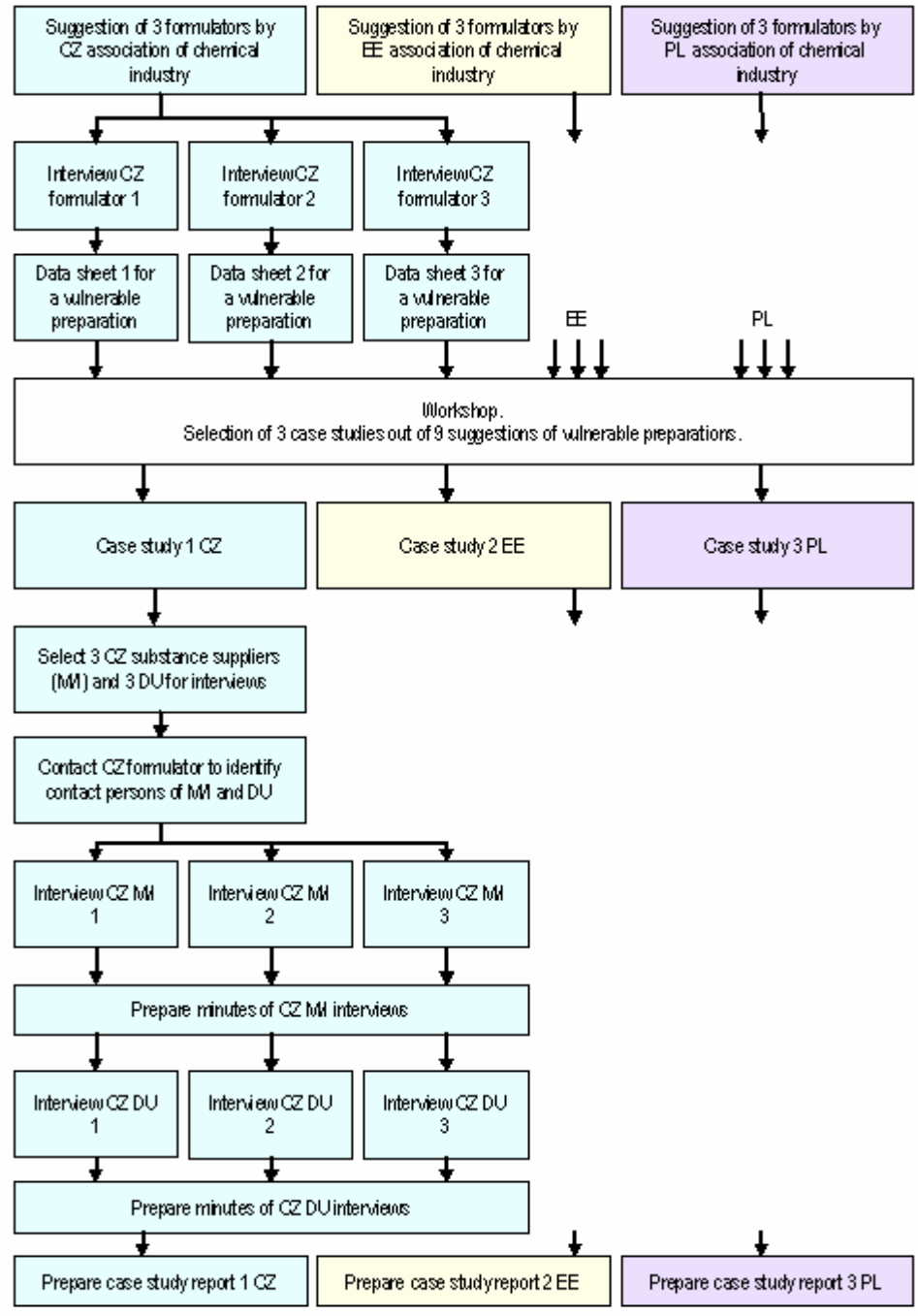
The second interview stage is focused on substance suppliers. In these interviews, cost and price effects due to substance registration and the likelihood of substance withdrawal are key information necessary to calculate cost impacts on the level of preparations for each of the three case studies. This in turn provides the basis for the interviews with downstream users on the selected preparations.

5)Interviews with downstream users

The third round of interview are at the level of downstream users. The cost share of chemical preparations on their total production, and the cost impacts of substance registration or withdrawal on the end product are the key outcomes of this step.

The complete plan of the empirical fieldwork is shown in Figure 1 schematically. Eventually, due to various reasons stated later in the case presentation, and the time constraints, this approach was adapted pragmatically. Interviews with suppliers and downstream users of the selected preparation were not possible to be conducted and a total of 14 specialty chemicals manufacturers were interviewed.

Figure 1 Planned operational procedure of empirical fieldwork with companies



As discussed in the Introduction, due to various difficulties encountered in the exercise, it was not possible to establish consistent value chains as envisaged in the above presented structure. Nevertheless one direct supply chain from substance manufacturer to formulator could be analysed. In order to be able to calculate the cost pass through as described in chapter D.3.3, the methodology had to be adapted in the way that unavailable data from suppliers on their production volume of substances, which are used in preparations at formulator level, had to be substituted through market information and/or estimates from formulators. In the Czech cases, this was done through direct formulators contacts with his suppliers and in the case of Estonia, expert judgements were made partially based on the production data in the IUCLID database. The resulting information in both cases could not be double checked with the suppliers.

D.3.2 The concept of vulnerable preparation and substance

The study is focused on the specialty chemical sector, and within that, on vulnerable preparations which are at the same time of key economic importance for the company. Key preparation means that it

(a) contributes considerably to the turnover (cash cow),
(b) constitutes a significant part of the competitive advantage of the company (star) and/or
(c) is of considerable strategic importance for the company.

These selection criteria exclude niche products of minor significance for the economic performance of the company. Moreover, a preparation is considered as vulnerable under REACH, if functional input substances are threatened by withdrawal as a consequence of REACH. In fact, such a substance itself has then to be considered as vulnerable. Especially low volume and low price chemicals bear the characteristics of vulnerability.

In this context, vulnerability of a substance means that the substance supplier may decide or not to invest to register and produce substance. Accordingly, the decision of a company to phase out production because the investment into registration cost is not profitable is considered as an investment problem, for which the net present value (NPV) is the decisive criteria.

Equ. 1 $$K_N = \frac{w \cdot P \cdot A}{f_N} - I_0$$

Equ. 2 $$f_N = \frac{(1+p)^N \cdot p}{(1+p)^N - 1}$$

K_N ..... net present value
w ..... profit margin for the substance ($0 < w < 1$)
P ..... price of substance [EUR/kg]
A ..... yearly production of the substance [kg/a]
f_N ..... annuity factor [1/a]
p ..... discount rate ($0 < p < 1$) [1/a]
N ..... payback time [years]
I_0 ..... cost of registration for the substance [EUR]

With the profitability requirements of the company, given by discount rate and payback time, the investment into registration is commercially attractive if the NPV is not negative. For registration by a single company the cost figures of *Table D.6* were applied, which were taken from the source documents of the European Commission's extended impact assessment studies, and were adapted to late changes on testing costs for the 1-10 t/a band. The costs refer to the average cost scenario of JRC. Since in the published extended impact assessment no substance specific cost assumptions are available, the figures from the source documents were used, which are based on a rate of 1,000 EUR per person and day, and differentiate between dangerous and

non-dangerous substances. The assumption of a rate at 875 EUR/person-day as in the Commissions extended impact assessment reduces registration cost slightly, but the differences turned out to be irrelevant for the results.

Table D.6 Applied costs of single registration in EUR per substance

Costs elements	1-10 t/a	10-100 t/a	100-1000 t/a	> 1000 t/a
Hazard Assessment: Art. 13, 3 a-d		1,500	8,700	8,700
Robust Study Summary: Art. 9 a vii; Annex I, 1.1.4, 3.1.5 (Summary of full study reports from application of Annexes V to IX)			500	1,000
Exposure Assessment: Art. 13, 4 a for dangerous substances		2,700	7,200	19,500
Liaison with downstream users: Art. 13, 4. a for exposure assessment of dangerous substance		3,500	12,000	15,000
Risk characterization: Art 13, 4 b for dangerous substances		800	3,500	3,500
CSR: Art. 13, 1		1,000	2,000	2,000
Administration for the preparation of the technical dossier	5,000	5,000	10,000	10,000
Agency fees	400	400	8,000	8,000
Testing (IHCP "average test needs") to fulfil provisions of Annex V to VIII	7,700	73,100	163,000	208,000
Registration costs non-dangerous substance	**13,100**	**81,000**	**191,700**	**236,700**
Registration costs dangerous substance	**13,100**	**88,000**	**214,900**	**275,700**

Referring to dangerous substances listed in Directive 67/548/EEC

Registration costs can be lowered, and registration of an endangered substance can become commercially attractive, if the company enters a registration consortium that does a single registration for all its member companies. A recent report for the European Commission deals extensively with potential registration costs reduction due to consortia formation (RPA 2004). In this study, when more than three producers of the same substances are registered in the UCLID database, it is likely that consortia would be formed.

D.3.3 Cost pass-on

The other crucial issue with regard to vulnerability is the possibility to pass-on registration costs to customers. As all manufacturers and importers in the European Union are affected by the REACH regulation, the pass-on of costs along the value chain should in principle be possible. To which extent cost pass-on will be possible for a specific company, however, depends on a variety of specific conditions. If, for instance, a registration consortium cannot be established, a small manufacturer has to bear the same registration cost as a company with a large production volume of the same substance. This causes the small company to face higher rise in sales price to absorb registrations costs, but on a competitive market he can not exceed the price of his larger competitor. So, evidently, the market structure, that is, the quantity and size distribution of firms and the likelihood of strategic behaviour play an important role. Equ.3 is used for the calculation of a full pass-on of registration costs on price. Note that after this increase in price, the margin in EUR/kg remains unchanged after investment into registration.

Equ. 3 $$\Delta P_k = P_k - P_{0k} = \frac{I_{0k} \cdot f_N}{A_k}$$

P_{0k} ..... price of substance prior to REACH [EUR/kg]

P_k ..... price of substance under REACH [EUR/kg]
I_{0k} ..... cost of registration of the substance [EUR]
A_k ..... yearly production of the substance by the supplier(s) [kg/a]
f_N ..... annuity factor [1/a]
$0 < p < 1$ ..... discount rate [1/a]
N ..... payback time [years]

The relative cost increase of the preparation due to the price increase of the contained substances is given in Equ.4.

Equ. 4 $$\frac{\Delta C}{C_0} = \frac{C - C_0}{C_0} = \sum_{k=1}^{K} c_k \frac{P_k - P_{0k}}{\overline{P}_0}$$

C_0 ..... preparation cost prior to REACH [EUR/kg]
C ..... preparation cost under REACH [EUR/kg]
P_{0k} ..... price of substance k prior to REACH [EUR/kg]
P_k ..... price of substance k under REACH [EUR/kg]
c_k ..... concentration of substance k in the preparation ($0 < c_k < 1$)
K ..... number of substances in the preparation

All interviews have been performed in a three step approach:

1. *Prior* to the face to face interviews, the companies were asked to complete those parts of the questionnaire containing the requested techno-economical data, most of all confidential business information, and send it back to the interviewer.
2. In the *subsequent* face to face interview these data were checked for consistency and discussed with the interviewees. In the same meeting the more qualitative information of the questionnaire has been gathered.
3. *Finally*, the outcome of both previous steps has been documented in an interview protocol. There it has been highlighted what information was supplied by the company and what was interpretation of the interviewer. This documentation was sent to each interviewed company for authorisation. The authorised documentations were the base for this report[2].

This design of information gathering gave the interviewees the chance to collect reliable business data from company's databases and to avoid misunderstanding and misinterpretation between them and the interviewers. The company questionnaires are part of the Annex.

The interviews revealed a lot of confidential business information, not suitable for publication. This restriction makes it difficult for the reader to trace and verify the reported results in the chapters "Company analysis".

D.4 Czech Republic

D.4.1 The specialty chemical sector

D.4.1.1 The Czech chemical industry – an overview

In the Czech Republic, the manufacturing sector contributed a value added of EUR 18,100 million, or 23%, to the country's GDP of EUR 78,400 million generated in 2002 (EUROSTAT). According to the definition of the Czech Chemical Industry Association, chemical industry in the broader sense includes chemicals and pharmaceuticals (NACE 24), rubber and plastics

[2] In the case of Poland, two companies sent the filled in protocol with the discussion results after the face to face interview, one company provided the questionnaire in beforehand with information which was considered sufficient complete. As a consequence, in the case of Poland it was not deemed necessary to send the protocols back to the companies for authorisation.

processing (NACE 25) and coke manufacture and crude oil refinery (NACE 23). In 2002, these three categories made up 6, 6 and less than half percent, respectively, to the value added of the manufacturing sector. In total, they contributed to 12%, or EUR 2,100 million (CZK 63,000 million)[3]. At the same time, the contributions of those three sectors to the turnover of the manufacturing sector were around 5, 6 and 2 % respectively, and equalled to a total of EUR 8,900 million or CZK 272,000 million. Accordingly, the chemical products (NACE 24) contributed 2% (EUR3,800 million) to the turnover and a same 2% (EUR 1,000 million) to the GDP of the whole Czech economy (CMIT 2004).

Over time, the turnover of the chemical industry (in constant 1995 prices) increased from less than EUR 2,000 million in 1992 to about EUR 3,200 million in 2000, which corresponds to an average annual increase by 6 %. Since 2000 the turnover of chemical products (NACE 24) rubber and plastics (NACE 25) has been increasing very slowly, while that of rubber of plastic products continued its trends. Relative to the development of the entire manufacturing sector, these figures are less pronounced, as turnover of manufacturing has increased at a similar rate until 2000, however at a faster pace in the time period thereafter. Accordingly, the chemical industry maintained a more or less constant share (of turnover) of slightly more than 6% of total manufacturing until 2000, but lost ground since then, yielding a share of slightly less than 5% in 2003.[4] Conversely, the number of employees in the chemical industry decreased from about 49,000 in 1997 to less than 44,000 in 2000 and remained constant thereafter.[5] This divergence in the development of turnover and employment in the Czech chemical industry is best explained in terms of a substitution of capital-intense automatic production devices for human workforce with a concomitant increase in labour productivity.

Slightly more than 800 companies constitute the sub-sector chemicals products (NACE 24) – a figure that increased sharply in the period of ongoing privatisation and came to a halt in 2000. The gross profit margin is given with 4.4 % of the turnover. No figures are available for R&D expenditures.

D.4.1.2 Overview of the Czech specialty chemicals

The number of useful sources for this exercise is limited. Most of the information was drawn from two sources: annual reports of the Association of Chemical Industry of the Czech Republic (SCHP) and of the Czech Ministry of Industry and Trade (CMIT 2004; 2004).[6] None of these sources, however, explicitly specifies the specialty chemical sector. Therefore, as discussed in the previous section, specification of data is made according to the NACE system. *Table D.7* gives a first hint how the total turnover of EUR 7,900 million of the chemical industry, including NACE 23, and its 94,000 employees are distributed among the different NACE categories.

Table D.7 Share of the sub-sectors of the chemical industry's turnover and employment in 2003

NACE category	Subsector	Turnover (%)	Employees (%)
23	**Crude oil processing**	**19.4**	**3.0**
24	**Chemicals and pharmaceuticals**	**37.3**	**37.5**
24.1	Basic chemicals	22.2	17.1
24.2	Pesticides and other agro-chemical products	0.4	0.7

[3] During the last decade, the exchange rate of the Czech currency fluctuated around an average CZK 30 per EUR. In order to facilitate the comparability between the Czech, Polish and Estonian parts of the report, CZK figures are generally recalculated into EUR according to this exchange rate.

[4] Czech Republic Statistical Office

[5] This corresponds to 0.8 percent of the Czech workforce (CMIT 2003).

[6] Additional information could be gathered in an interview with the Czech Chemical Industry Association (SCHP 2004)

24.3	Paints, varnishes, printing ink and mastics	1.9	2.2
24.4	Pharmaceuticals, chemicals and botanical products	5.9	6.5
24.5	Soap & detergents, cleaning and polishing preparations, cosmetic products	2.5	3.8
24.6	Other chemical products	4.2[1]	7.3[1]
24.7	Man-made fibres		
25	**Rubber and plastics processing (NACE 25)**	**43.3**	**59.5**
25.1	Rubber products (NACE 251)	19.1	17.9
25.2	Plastic products (NACE 252)	24.2	41.6
	Total	**100**	**100**

Source: SCHP (2003) and CMIT (2004)
[1] Figures for NACE 24.6 and 24.7 are not distinguished

None of our information sources provides specific information about both NACE categories 24.6 and 24.7. In order to nevertheless make use of the provided data, we made the following assumptions:

- After privatisation and restructuring of the Czech chemical industry, the production of man-made fibres does not play a significant role anymore in the Czech Republic (SCHP 2004). EUROSTAT data show that turnover and value added of NACE 24.7 are one forth and less than one fifth, respectively, of the combined NACE 24.6 and 24.7 data. Accordingly, we can use the aggregate of NACE 24.6 and 24.7 as a good approximation for NACE 24.6.

- Disaggregated data on production of dyes and pigments, 24.12 are not available.

- According to *Table D.7*, pesticides and agro-chemicals (NACE 24.2) play a role in the chemical sector, but its contribution in terms of turnover and employment are shown to be below 1 and 2 %, respectively. As a consequence, even the aggregate of NACE categories 24.2, 24.3, 24.6 and 24.7 employed in SCHP (2003) can be used in combination with NACE 24.5 as an approximation for specialty chemicals.

D.4.1.3 Economic performance of the specialty chemical sector

In the following, a set of indicators is used to describe the performance and recent development of the specialty chemical sector as compared to the performance and development of the chemical industry as a whole.

Table D.8: Turnover (sales) of chemical products in constant prices in 2000 to 2003

(Million EUR)[1]	2000	2001	2002	2003[2]
NACE 24.1	2633.0	2538.4	2316.9	2496.8
NACE 24.2	30.9	31.6	37.1	42.5
NACE 24.3	140.8	148.6	162.2	191.8
NACE 24.4	482.8	529.8	657.8	651.1
NACE 24.5	381.8	405.8	483.2	265.3
NACE 24.6 + 24.7	327.7	348.5	387.4	462.9
NACE 24	**3997.1**	**4002.8**	**4044.6**	**4110.6**
Cumulative index	100.0	100.1	101.2	102.8
Specialty chemicals[3]	**850.4**	**902.9**	**1032.9**	**920.1**
Cumulative index	100.0	106.2	121.5	108.2

Source: CMIT (2004) and personal calculation
[1] recalculation from CZK with a rate of 30 CZK/EUR; [2] preliminary;
[3] NACE 24.3 + 24.5 + 24.6 (+ 24.7)

Table D.8 shows that, in terms of turnover, the specialty chemical sector grew significantly faster than the chemical sector in general. While, in the period from 2000 to 2003, the latter grew in average by less than 1 % annually, the average rate of increase for the former was almost 3 %. Taking into account that the turnover in NACE 24.5 was distorted by the fact that the main part of one of the biggest manufacturers of cleaning agents could not be included, the actual growth rate of the specialty chemical sector may in fact be even considerably higher. In accordance with this difference in growth between specialty and total chemicals, the relative share of specialty chemicals grew from 21 (2000) to nearly 26% in 2002 and then down to 22% in 2003.

Table D.9: Value added of the chemical industry in constant prices, 2000 to 2003

(Million EUR)[1]	2000	2001	2002	2003[2]
NACE 24.1	655.0	606.7	583.2	646.8
NACE 24.2	9.1	9.6	14.0	15.0
NACE 24.3	35.1	38.7	43.7	53.2
NACE 24.4	199.2	222.4	266.3	270.2
NACE 24.5	72.5	69.9	97.1	86.5
NACE 24.6 + 24.7	108.4	103.9	117.9	150.7
NACE 24	**1079.3**	**1051.2**	**1122.1**	**1222.3**
Cumulative index	100.0	97.4	104.0	113.2
Specialty chemicals[3]	**215.9**	**212.5**	**258.8**	**290,4**
Cumulative index	100.0	98.4	119.8	134.5

Source: CMIT (2004) and personal calculation
[1] recalculation from CZK with a rate of 30 CZK/EUR; [2] preliminary;
[3] NACE 24.3 + 24.5 + 24.6 (+ 24.7)

The development in the specialty chemicals sector looks even more favourable when the value added is considered. Similar to the turnover, the contribution of the specialty chemical sector to the added value of the total chemical sector grew between 2000 and 2003 from 20 to 24 %. However, during this time period, the average growth rates of the specialty chemicals (more than 10%) were more pronounced than that of chemicals industry (4%), as shown in *Table D.9*)..

The share of employment in the specialty chemical sector of that in the total chemical sector was 30 % in 2000 and grew to more than 35 % in 2003 (see *Table D.10*). These shares are much higher as compared to turnover or added value and can be reasonably explained by the averagely lower production volumes of specific substances and preparations and by the lower degree of automation.

Table D.10: Number of employees in the period 2000 to 2003

(Employees)	2000	2001	2002	2003[1]
NACE 24.1	24,300	23,370	21,431	20,058
NACE 24.2	772	668	682	713
NACE 24.3	2,306	2,419	2,462	2,618
NACE 24.4	6,567	6,982	8,100	7,751
NACE 24.5	4,069	4,098	4,453	4,569
NACE 24.6 + 24.7	6,974	6,893	7,458	8,432
NACE 24	**44,988**	**44,430**	**44,586**	**44 141**
Cumulative index	100.0	98.8	99.1	98.1
Specialty chemicals[2]	**13,349**	**13,410**	**14,373**	**15,614**
Cumulative index	100.0	100.4	107.7	117.0

Source: CMIT (2004) and personal calculation
[1] preliminary; [2] NACE 24.3 + 24.5 + 24.6 (+ 24.7)

Another interesting fact is the less dynamic growth in employment (as compared to value added), showing an average annual increase by 5% in the specialty chemical sector and a contrary decrease by 0.6% in the total chemical sector. The generally lower rate of increase in employment as compared to value added in both chemical products (NACE 24) and specialty chemicals indicates that the productivity of labour have been increasing. And indeed, this rationalisation is confirmed in *Table D.11*.

Table D.11: Labour productivity from value added in constant prices, 2000 to 2003

(1000 EUR/employee)[1]	2000	2001	2002	2003[2]
NACE 24.1	27.0	26.0	27.2	32.2
NACE 24.2	11.8	14.4	20.5	21.0
NACE 24.3	15.2	16.0	17.8	20.3
NACE 24.4	30.3	31.8	32.9	34.9
NACE 24.5	17.8	17.1	21.8	18.9
NACE 24.6 + 24.7	15.5	15.1	15.8	17.9
NACE 24	**24.0**	**23.7**	**25.2**	**27.7**
Cumulative index	100.0	98.6	104.9	115.4
Specialty chemicals[3]	**16.2**	**15.9**	**18.0**	**18.6**
Cumulative index	100.0	98.0	111.3	115.0

Source: CMIT (2004) and personal calculation
[1] recalculation from CZK with a rate of 30 CZK/EUR; [2] preliminary;
[3] NACE 24.3 + 24.5 + 24.6 (+ 24.7)

Concluding the above results, the specialty chemicals sector was found to show an increase in turnover whereas the chemical industry in general is facing a standstill. The increase in value added for specialty chemicals is even stronger, justifying an increase in employment which is again not the case for the chemical industry as a whole. This implies that at least on the domestic market, the competitiveness of the specialty chemicals is considerably stronger than that of the chemical industry as whole.

D.4.1.4 Foreign trade

It was shown in the overview over the economic situation of the 10 new member states that the Czech Republic, like all new member states, shows a large deficit in foreign trade and that the major part of this deficit is due to the chemical industry and its products. As shown in *Table D.12*, 65% of the chemical industry's sales go into export, whereas chemical products worth 135% of these sales are imported.

Table D.12: Development in foreign trade in chemical products (in current prices), 2000-2003

Total exports (Million EUR)[1]				
CPA[2]	2000	2001	2002	2003
CPA 24.1	1479.3	1419.6	1166.5	1306.6
CPA 24.2	18.9	18.4	17.3	23.5
CPA 24.3	87.3	77.2	66.6	68.3
CPA 24.4	322.9	373.3	328.0	364.6
CPA 24.5	325.6	348.9	435.1	426.4
CPA 24.6	133.1	189.4	156.4	174.1
CPA 24.7	100.6	106.0	86.4	91.9

CPA 24	**2467.6**	**2532.7**	**2256.3**	**2455.4**
Cumulative index	100.0	102.6	91.4	99.5
Included EU	1178.8	1176.8	992.6	1148.2
Cumulative index	100.0	99.8	84.1	97.3
Specialty chemicals[3]	**545.9**	**615.5**	**658.1**	**668.8**
Cumulated index	100.0	112.7	120.6	122.5
Total imports (Million EUR)[1]				
CPA[2]	2000	2001	2002	2003
CPA 24.1	1709.8	1854.4	1736.8	1906.8
CPA 24.2	116.3	146.4	146.0	138.3
CPA 24.3	344.9	353.6	342.2	361.7
CPA 24.4	1002.0	1167.0	1199.5	1407.3
CPA 24.5	349.1	359.0	362.7	399.0
CPA 24.6	551.0	569.6	567.7	609.5
CPA 24.7	304.6	296.8	260.8	269.0
CPA 24	**4377.7**	**4746.7**	**4615.8**	**5091.5**
Cumulative index	100.0	108.4	105.4	116.2
Included EU	2909.2	3156.6	3131.4	3471.3
Cumulative index	100.0	108.5	107.6	119.4
Specialty chemicals[3]	**1245.0**	**1282.2**	**1272.6**	**1370.2**
Cumulative index	100.0	103.0	102.2	110.1
Net balance (Million EUR)[1]				
CPA[2]	2000	2001	2002	2003
CPA 24.1	-230.5	-434.7	-570.3	-600.2
CPA 24.2	-97.3	-128.1	-128.7	-114.9
CPA 24.3	-257.6	-276.4	-275.6	-293.4
CPA 24.4	-679.2	-793.7	-871.6	-1042.7
CPA 24.5	-23.5	-10.1	5.8	27.4
CPA 24.6	-418.0	-380.2	-411.4	-435.3
CPA 24.7	-204.0	-190.8	-174.4	-177.1
CPA 24	**-1910.1**	**-2214.0**	**-2359.4**	**-2636.1**
included EU	-1730.4	-1979.7	-2138.8	-2323.1
Speciality chemicals[3]	**-699.1**	**-666.7**	**-681.2**	**-701.3**

Source: CMIT (2004) and personal calculation

[1] recalculation from CZK with a rate of 30 CZK/EUR;

[2] CPA is the consumer counterpart of NACE; [3] CPA 24.3 + 24.5 + 24.6

The deficit grew by more than 10% annually during the past four years. Specialty chemicals contribute proportionally to the export and import of the products of chemical industry in general. In 2003, for instance, specialty chemicals made up 27% of both export and import of all chemical products. This percentage is only slightly higher than the contribution of specialty chemicals to turnover (22%) and value added (24%). This implies that the growth of the deficit is, to a large extend, due to the import of bulk chemicals and pharmaceuticals.

While the trade deficit for specialty chemicals remained almost constant since 2000, it is worthwhile to have a closer, separate, look at the export and import figures. It is evident that both increased over time; but in order to keep the deficit constant, the export had to grow faster as it started from a lower basis. In fact, it can be derived from *Table D.12* that exports of specialty chemicals grew by more than 7 % annually in average, whereas imports increased by only little more than 3 %. This is again an indication of the competitiveness of the Czech specialty chemical sector.

It is then worth to exam that why the Czech chemical industry is competitive in producing specialty chemicals but not bulk chemicals and pharmaceuticals? One explanation could be the availability of production factors. Specialty chemicals production is more labour intensive, relying more on skilled labour. By contrast, bulk chemicals production is capital intensive and pharmaceuticals rely on extensive RaD efforts – both requiring large amounts of financial capital. This seems to be reasonable considering that in the Czech Republic, the availability of skilled labour is generally high, while capital can be limited.

Regarding foreign trade, almost half of the total chemical exports go to EU-15, one third to CEFTA (Poland, Hungary, Slovakia, Slovenia, Romania, Bulgaria) and one fifth to the Rest of the world (RoW). With a share of more than two thirds, imports are more EU-oriented than export, whereas the share of the CEFTA states is rather small (see *Table D.13*). For specialty chemicals, the imports appear to be similarly EU oriented and even more for paints and varnishes. By contrast, the exports of specialty chemicals, especially soaps and detergents but also paints and varnishes, are more CEFTA-focussed. This implies that, with regard to the potential impact of REACH, exports of these sub-sectors to countries outside the EU-25 would most likely be more negatively affected. On the import side, sectors are affected insofar only as they rely on inputs from outside the EU-25 that may or may not be registered by their suppliers or importers. Due to the higher degree of vertical integration in the Czech chemical industry (DG Enterprise 2000), this does not seem to be an issue for the specialty chemical sector.

Table D.13: Exports and imports of chemicals by main territories and groups of products in 2003

Products of aggregation/sector	Shares of territories (%) in					
	exports			imports		
	EU	CEFTA	RoW	EU	CEFTA	RoW
Chemicals and pharmaceuticals	**46.7**	**32.8**	**20.5**	**68.2**	**13.0**	**18.8**
Basic chemicals	58.5	25.8	15.6	65.7	15.2	19.1
Paints and varnishes	34.0	55.5	10.5	90.0	4.8	5.2
Pharmaceuticals	34.3	34.1	31.6	65.1	12.1	22.8
Cosmetics, soap & detergents	15.5	55.8	28.7	67.0	25.9	7.1
Chemical fibres	78.3	17.0	4.7	50.9	20.9	28.2
Other	49.8	26.5	23.7	76.5	3.9	19.6

Source: SCHP (2003) and personal calculation

D.4.1.5 Conclusions from statistical data analysis

Taking all the arguments together, the specialty chemical sector of the Czech Republic seems to be in a relative good position. While the Czech chemical industry stagnated in the last few years, the specialty chemical sector was able to expand. Also productivity increased steadily. More importantly, however, the specialty chemical sector could maintain its competitive position also on the international level. Competitive disadvantages arising from exports in non-EU countries (without the need to comply with REACH) exist and are similar to those of the entire chemical industry. They will affect only some products and some companies, but more detailed information on this issue can only be provided in the case studies.

D.4.2 Company analysis

In this section, REACH impacts assessed on the companies' level are reported. Impacts on selected vulnerable chemicals are assessed and reported in D 4.3 .

D.4.2.1 Characterisation of interviewed companies

Three companies were selected for interviews by the Association of Chemical Industry of the Czech Republic (SCHP). Another company was included on suggestion of CEFIC. So a total of four companies received the questionnaires and were visited for interviews.

Part of the Czech company sample are two substance suppliers, of which one produces mainly intermediates for the synthesis of substances accounting to 95% of its turnover, and two formulators of preparations. One of the formulators produce only paints and varnishes, the other has a mixed portfolio, covering washing and cleaning agents for households, hospitals and industry, as well as accumulator masses. Three of the companies are of mixed M/I (Manufacture/Importer) and F (Formulator) type, because both M/I also sell preparations, whereas one F also produces some substances. But in all three cases the core business dominates by far the turnover revenues.

Privatisation of the companies was completed in the early 90ies. All companies have more than 50 years experience in producing chemicals.

D.4.2.2 Economic situation and product portfolio

Total turnover of the Czech chemical industry is 3,800 million. EUR. The four companies represent 6 % of this figure. One formulator is mainly oriented to the domestic market. Exports to EU countries contributes considerably to turnover of the three other companies. Export to non-EU is not important for any of the companies. In total, the four companies export 3 % of their turnover to non-EU countries.

Wages vary between 2.65 and 4.50 EUR per hour in the interviewed companies, which implies a considerable competitive advantage over EU-15. The four companies show high annual growth rates, between 5.5 and 7.7 %/a. Overall profit margin varies between 4 and 14 % of turnover.

All companies claim to have limited power to influence raw material prices of their suppliers. On the product side, competition is primarily lead by global players in the EU; companies from outside EU play a minor role on the product markets. Due to low workers wages, raw material and chemical substance input are the dominant single cost factor. In the weighted average 44 % of total cost are spent to purchase raw materials for production. Labour costs represent 6% for M/I and 18% for formulators.

For registration decisions under REACH the profitability requirements of the companies for investments are of high importance, especially for low-volume substances. Restrictive requirements may eliminate such substances from the company's product portfolio. In the average, pay-back times were specified to be 4.4 years, with a span from 3 to 6 years. The average required discount rate is 6.6 %/a, with a span between 4 and 10 %/a. Of course, the actual specification of these figures also depends on the respective type of substance.

Raw material origin is by far dominated by EU. Of the total of 726 raw materials and chemical substances used for production in the four companies only 50 (7 %) originate from outside EU. This holds for direct purchases. As far as raw materials are supplied by chemical retailers based in the EU, materials origin in the majority of cases is not revealed to the customer.

The number of produced substances, which varies widely between the interviewed M/I, determines the direct cost burden of the company under REACH, because the manufacturers of the substances are responsible for registration. Dangerous substances bear a somewhat higher cost burden. According to the report of the interviewed companies, three companies consider that all the products are classified as specialty chemicals (substances or preparations), while one company did not report. For the two substance suppliers, a list was given with more detailed

information on a total of 16 substances, of which 6 are considered specialties based on the CEFIC definition.

Indirect costs under REACH are, among others, caused by reformulation of preparations once substances are withdrawn from the market because of commercially unbearable registration costs. These indirect costs are determined by the number of preparations pending for reformulation in case of withdrawal of one certain substance. The figures given by the companies vary between 1 and 20 preparations containing one and the same substance.

D.4.2.3 Accession impact and HSE management

For all companies, to comply with the Chemical Acquis was neither a great technical problem nor of considerable cost relevance. The heaviest financial burden of the Acquis, according to the companies, is related to the implementation of the IPPC directive. In all interviewed companies the provisions of the Chemical Acquis were meanwhile in force.

All companies stated that the Acquis has increased the administrative burden. This is however not evident from the figures provided. Of the total 2396 employees of the interviewed four companies, a total of 8 full-time-equivalents persons (=0.3%) have been involved in the implementation of the Acquis. Admitted benefits are higher risk prevention and safety standards, as well as the improvement of the company's image towards the broader public, which proved to be a problem in the past.

Together with the changed classification and labelling scheme, the key element of the enforcement of the new chemical regulation introduced by the Acquis is the compilation, maintenance and distribution of SDS. Indicator for this effort is the number of SDS managed by one employee. Averaged over all interviewed companies, 72 SDS are managed and maintained by one employee. This figure is significantly lower than in EU-15 (Fraunhofer 2004).

In all companies the number of SDS corresponds to the number of marketed dangerous substances and preparations. This underlines that the SDS-related directives are fully implemented and enforced in the interviewed companies.

All companies run an ISO 9000 quality management system, three companies in addition an ISO 14000 environment management system. None of them holds an EMAS certification nor do they have plans to apply for EMAS. All companies run a sophisticated chemicals inventory database that allows tracing input, internal use and output of chemicals. All companies expect additional workload for HSE under REACH, but none had so far performed a quantitative assessment.

D.4.2.4 Innovation performance

The budget for research and development (R&D) of the interviewed companies is far below EU-15 figures. In total the four companies spend 1 % of turnover for R&D. According to CEFIC, EU-15 companies spend 5 to 8 % of turnover for R&D, and R&D staff on total employees is in the range of 4 to 8 %. 98 persons of a total of 2396 employees are concerned with R&D in the four companies. These are 4 % of total employees, achieving the lower limit of the CEFIC figures of EU-15.

The low investment in R&D in the companies is a strategic disadvantage in future competitiveness with EU-15 companies, and it may also be a handicap for the implementation of REACH. REACH will to a certain extent create the need for adaptation of the product portfolio and the development of substitutes, which are typical tasks of the R&D units, in particular for the specialty chemical which is R&D intensive. In the interviewed companies, innovation is mainly concentrated on cost reduction in production processes.

However, with the exception of one company, total investment rate (4.8 % of turnover), is, according to CEFIC statistics comparable to EU-15 chemical companies.

In one company notification of a new substance is under way, but not yet completed. Therefore no figures were available about personnel and testing expenditures for that case.

Both substance suppliers stated that phasing-out of substances due to economic or technical reasons have occurred in the past. The typical lifetime for specialty chemicals was estimated by companies at 4 to 5 years, i.e., a phasing-out rate of 20 to 25 % per year. However, the number of substances actually phased-out of production every year by both substance suppliers is close to 10 %. This discrepancy seems to indicate that product lifetime has been underestimated.

The reformulation of chemical preparations will be inevitable if substances are withdrawn from the market because of registration costs under REACH. Although this possibility is considered plausible by the interviewed companies there is in general little information available about the corresponding indirect costs of REACH. However, both preparation formulators submitted precise figures about the costs and time spent for reformulation. The figures provided by each of their companies were in the same range and seem therefore quite reliable.

Table D.14 Cost and time to market for a reformulation of preparations

	Unit	Span of company's guess
Cost of a refreshment …[a]	kEUR	15 – 20
… time-to-market	month	6 – 12
Cost of a redesign …[b]	kEUR	25 – 50
… time –to-market	month	6 – 24
Cost of a new development …	kEUR	50 – 150
… time-to-market	month	20 - 48

[a] substitution of a none functional component (modification), needing primarily stability testing

[b] substitution of a functional component (reformulation)

Cooperation with downstream users of chemicals is a key factor under REACH. Both preparation formulators stated that they regularly cooperate with their substance supplier and downstream users. Except for certain specialities, e. g. resins, there is no cooperation between substance suppliers and industrial downstream users in the manufacturing sector.

D.4.2.5 Strategies to cope with REACH

All companies collected information on the REACH proposal. Nevertheless the knowledge of REACH seems to be excursive. None of the interviewees knew the EC figures for registration costs. In this context, language turned out to be a crucial barrier. Staff below the top management, which are responsible for company's implementation of REACH, were not, except in one company, fluent in English. The reason is that commercial activities in the past were mainly oriented to Russia and Eastern countries. Till today no official translation of the REACH proposal into Czech language is available. Since mid 2004 a non-official, privately sponsored Czech translation is available. It was issued 8 month after publication of the English version on 29 October 2003. Companies rely on information offered by national bodies.

So far, none of the interviewed companies made an assessment of the REACH impacts or its effect on substances' phase-out. The price strategy of the M/I is clearly to pass on registration costs to customers. No one expected a relocation of production sites outside EU as a consequence of REACH. Main incentive for relocation, if any, is the advantage of being present in important customers markets. All interviewees see the need to improve information exchange along the supply chain. Two companies stated that know-how drain due to this information exchange is a problem, especially for specialities. All others do not seem to be affected by this. Both M/I are willing to join consortia for registration, one expects 2 to 3 members in each

consortia, the other guess that for inorganic basic chemicals all EU competitors will become part of a consortia, moderated by CEFIC.

None of the companies have so far developed a view of how to organise the procedure of cooperation along the supply chain, e. g. to perform exposure assessments and risk characterisation for the chemical safety report, requested under REACH for dangerous substances as part of the registration dossier.

The appreciation of REACH of the interviewed companies is overall adverse. The benefits, like better supply chain information, are in their view eroded by drawbacks, like bureaucracy, manpower and costs. Three companies made a guess for the additional staff needed for REACH implementation. With over 1300 employees in the three companies their first estimation is that they will need a total 3 additional employees (~0.23%).

The estimation of costs for the registration of substances from own production exhibits a quite moderate cost burden, not endangering competitiveness nor causing business harms. Total registration costs are related to turnover and profit cumulated within 11 years, because this is the time horizon foreseen for registration under REACH. For both M/I, part of the substance portfolio are transported intermediates with considerably reduced testing requirements, which was not taken into account in the assessment. In this case, for one M/I, the registration would cost 9.6 % of company's profit margin, for the other 4 %. This erosion of the profit margin only occurs under the assumption that registration costs can not be passed on to customers. Data provided by the companies allowed NPV calculation for 11 substances, of which one substance, a polymer, has a negative NPV. Should polymer be subjected to registration, this substance would be vulnerable to REACH.

For the preparation formulators the calculation of substance registration costs passed on by M/I is more complicated. One Formulator purchases over 140 substances and in addition 240 preparations for the production of paints and varnishes. To calculate costs for registration one has to know the production volume of the supplying M/I for each individual substance. This information is not available for the complete input chemicals portfolio. Therefore only a rough estimate of the direct cost impact of registration can be performed for formulators. It is assumed that substance price increase on the market is governed by the supplier with the highest production volume. He has the lowest specific cost burden per unit of production and is able to supply the substance with the lowest rise in price. The smaller competitors will not be able to achieve a higher price on the market. Therefore, the calculation of substance price increases uses the upper limit of the REACH substance category tonnage band. For substances in the highest tonnage band > 1,000 t/a cost impact is calculated with a reasonable production volume guess, where in the case of the above mentioned formulator, data was supplied by the formulator itself. On such basis the additional costs for the formulator due to registration under REACH are calculated under the assumption that total REACH triggered increase of substance price is passed-on to customers.

This assessment points out a problem for the formulator of paints and varnishes, caused by the large number of purchased substances. If registration costs are passed on by the M/I, the anyway small profit margin of that company will be further eroded by 58 %, if the company is not able to pass-on this cost increase to its customers. Additional cost burden arises with cost increases of purchased preparations, which could be in the same magnitude. Pass on of these costs to customers is easier for private use products, where 50 % of company's production is launched. But on the markets for industrial use the company is competing with large EU players. Altogether, this indicates REACH could cause a commercial problem for this formulator. However, further and more detailed business data and analyses are necessary to comprehensively assess the capability of this company to cope with REACH.

No problem with REACH is in sight for the other formulator. Its limited raw material portfolio reduces the cost impacts of substance registration under REACH. Pass on of substance

registration costs will degrade its overall profit margin by 4.3 %. Again, this degradation will only occur if the company is not able to pass on REACH cost impacts to his customers.

D.4.2.6 Future trends

Privatisation has been an issue in the past, but has been completed in all interviewed companies in the meantime. In one company, government still holds a considerable share (66%), but does not influence operational business management and is ready to transfer its share to a reliable shareholder. One company is fully committed to renew its product portfolio with more environmental friendly products. Safety at work was and still is an issue in the companies. Two companies are in the implementation process of the OHSAS 18001 standard, which is compatible with ISO 9001 and ISO 14001, aiming an integration of quality and environment management systems. Innovation is considered as important issue by all companies, but this is not backed by plans to increase the R&D budget. All interviewed companies are busy with streamlining present product portfolio to anticipate future market demands.

D.4.3 REACH impacts on selected chemicals

In this chapter three examples for calculated REACH impacts on individual chemical preparations are reported. These chemicals were selected by the companies as key and vulnerable preparations. "Key" means the product is of commercial or strategic importance for the company. "Vulnerable" means that severe impacts of REACH are expected. All three preparations reported are specialty chemicals, while about half of the components used in the preparations are specialties by CEFIC definition.

Preparation A

This chemical is an agent for surface treatment of steel. It is more expensive than its substitutes, but extracts less steel material off the processed surface. Therefore, the agent is predominantly applied for the treatment of (expensive) stainless steel. Selling price of the preparation is around 1.50 EUR/kg.

The preparation consists of three high volume chemicals. The formulator checked the production volumes of the input substances with the respective suppliers[7]. This information has been used for calculation of the cost impacts. Full pass-on of registration costs to substance price is assumed. Cost pass-on is based on a discount rate of 6.6 % and a pay back time of 4.4 years. These are the average profitability requirements of the interviewed Czech companies.

Under this assumption the price increase due to registration of the substances leads to a rise in the preparation's production cost of 0.0125 EUR/kg, corresponding to 0.8 % of present sales price.

As said above, application of the preparation in the downstream user industries is for surface treatment of stainless steel. Shaped flat stainless steel is sold for a price of 2.20 EUR/kg. Applying 7 kg of the de-scaling agent per ton of steel gives a steel cost increase of 0.00009 EUR/kg. This results in a semi-finished steel product sales price rise due to substance registration under REACH of 0.004 %.

[7] This information has not been cross checked at supplier level by the authors of this study.

Preparation B

This preparation is used as an electrode mass for rechargeable nickel-cadmium batteries. It is predominately used for portable appliances, like power tools, camcorders, flash lights etc. The sales price of the preparation is about 7.90 EUR/kg. The given information on the composition is with 94 % fairly complete. Information on three components is retained by the formulator.

The preparation formulator checked the production volumes of input substances with the respective suppliers[8]. Substance production volumes are between 60 and 30,000 t/a. Again full cost pass-on is assumed using the above given average values for discount rate and pay back time.

Substance registration under REACH causes for this anode accumulator mass a cost increase of 0.1597 €/kg. This amounts to 2 % of present sales price of this preparation.

A widespread product using this electrode mass is AA type (mignon) accumulators. Its weight amounts to 23 gram, of which 30 % are taken by the mass of the electrode. This gives a cost increase of 0.0011 EUR per piece. At a sales price of such an accumulator of at least 2 EUR the relative price increase is below 0.06 %.

Preparation C

This preparation is a varnish used as top-coating for metal surfaces. The sales price amounts to about 4.10 EUR/kg. The varnish contains 43 substances of which individual data were supplied by the formulator for 10, of which one is a polymer. These 10 substances amount to 96 % of total substance content.

The manufacturer (supplier) of the alkyd resin supplied its production volume. For the other components the formulator supplied information on the substance production volumes of its suppliers. The formulator has a total of 50 suppliers for preparation C. Because of this large number, it is assumed that information about suppliers production volumes are partly based on inquiries at suppliers, and partly on formulator's estimates. The calculation of registration triggered substance price increase is again based on the assumption of full cost pass on with a discount rate of 6.6 % and a pay back time of 4.4 years, which is the average profitability requirement of the interviewed Czech companies.

In spite of the large number of contained substances the cost increase of the varnish remains at 0.0451 €/kg, which corresponds to 1.1 % of present product price.

An industrial application on coated 0.5 mm flat steel has been selected to calculate the hypothetical impact on the end product price. With a steel price of 1.50 €/kg the coated semi-finished flat steel product costs around 6.50 €/m^2. Coating with 0.20 kg varnish per m^2 steel causes a cost increase of 0.009 €/m^2, or 0.14 % of the steel product price before REACH. This seems to be insignificant as compared with other influencing factors. Between December 2004 and December 2005 prices for bar and flat steel products increased by 46.8 %. Another example for external impacts on product prices is the Euro-Dollar exchange rate, which changed in the past years up to 50%.

One substance which is used as binder of the varnish has a negative NPV, and therefore has to be considered as vulnerable. This substance is a polymer with full registration obligation of its intermediates. The need for a reformulation of the varnish would arise in case of withdrawal. The binder in the varnish is an essential functional component. Substitution of it requires a basic reformulation of the preparation, causing additional cost of 40,000 to 50,000 EUR and a time-to-market of up to 7 month. Reformulation would increase the price of the paint by another

[8] This information has not been cross checked at supplier level by the authors of this study.

0.02 EUR/kg, calculating with company's profitability criteria of 4.5 % discount rate and 3 years pay back time. This sums up to a total price rise of the paint of 0.0651 €/kg.

D.4.4 Conclusions from country case Czech Republic

For the interviewed companies in the Czech Republic, a dominant orientation of their trade relations to markets of the former Soviet Union and its alliances outside EU is not evident. Of a total of 726 raw materials purchased for production merely 2 originated from non-EU Eastern Europe[9]. This is also true for company's product markets. Only a total of 3 % of turnover is exported to non EU countries, including Russia. Competing products of non EU origin on company's domestic and EU markets don't play a role at all.

A serious problem for Czech companies is the language barrier. The staff directly responsible for the implementation of REACH in the companies in general is not fluent in English, since in the past international commercial and technical exchanges took place with Russia and Eastern countries. This fact does not facilitate to anticipate new initiatives like REACH, leaving less time for company's streamlining and adoption. This is a country specific disadvantage in the competition compared to EU-15 companies.

R&D budgets are very low. Overall, interviewed companies spend 1 % of turnover for R&D, while companies in EU-15 have a R&D budget of 5 to 8 %. This low level of investment is a serious drawback for the future competitiveness of these companies on the European markets. This holds especially for specialty chemicals. Companies are aware of the huge importance of innovation for their business, but this awareness has so far not been translated into operational management decisions.

HSE standards seem to be quite close to EU-15. The chemical and workers protection Acquis is more or less fully implemented and in force. The heaviest financial burden of the Acquis, according to the companies, is related to the implementation of the IPPC. The major step of the chemical Acquis was the introduction of safety data sheets, which were not available ten years ago. The number of SDS managed by one person is with 40 to 70 lower than in EU-15 companies. As in the EU-15, quality management and environmental management systems grow together, in particular ISO standard, but not the European eco-management and audit scheme EMAS.

Cooperation along the supply chain has a tradition to the extent that it is necessary for the operational business. Supporting of the application technique of downstream users in the manufacturing sector by the formulator of preparations is business as usual. This leads to better customer loyalty and helps safeguarding the company's revenues. Regular contacts of substance suppliers with downstream users in the manufacturing sector are the exception. This behaviour does not differ from that of EU-15 companies.

The vulnerability analysis brought up one substance where doubts arise about maintenance of production under REACH. At the end of the required pay back time only 75 % of registration costs are recovered. The implementation of REACH increases the cost of the analysed preparations between 0.8% and 2%.

For three of the interviewed companies the results of this study do not indicate serious difficulties with the adoption of REACH. In the case of the fourth company the adoption of REACH could conflict with the ongoing efforts to implement the European VOC directive. Registration cost would substantially reduce the already small profit margin.

D.5 Poland

[9] This holds for *direct* purchases. As far as raw materials are supplied by chemical retailers in the EU, materials origin is in the majority of cases not known to the customer.

D.5.1 The specialty chemical sector

D.5.1.1 The Polish chemical industry – an overview

In Poland, the manufacturing sector contributed a value added of EUR 38.700 million, or 19%, to the country's GDP of EUR 202.500 million generated in 2002. This is similar to the corresponding figure (23%) in the Czech Republic. According to the understanding of the Polish Chamber of Chemical Industry (PIPC), chemical industry in a broader sense includes chemicals and pharmaceuticals (NACE 24) and rubber and plastics processing (NACE 25). In 2002, these two categories made up 7 and 5%, respectively, yielding a total contribution of 11%, or EUR 4.400 million (i.e. PLN 19.000 million)[10], to the value added of the manufacturing sector. At the same time, the contributions of those two sectors to the turnover of the manufacturing sector were 7 and 5% yielding a total of EUR 14.700 million (PLN 65.000 million).In 2003 is the gross profitability of the chemical industry and the rubber and plastics sector with 6 and 7% significantly higher than those 4% of industry as a whole (PIPC 2004a).

Over time, the turnover of the chemical industry increased from EUR 2.000 million in 1992 to almost EUR 8.000 million in 2001 (NACE 24, CEFIC 2005), which corresponds to an average annual increase of 25% before 1995, of 10% from 1995 to 2001 and only slight increase (of 1% p.a.) since then. Looking into the development of the entire manufacturing sector, the increase appears to be at a similar rate, that is, about 11% annually from 1995 to 2001 and between 1 and 2% thereafter. Accordingly, the chemical industry (NACE24) only slightly lost its ground with its share declining from 8% in 1995 to less than 7% in 2002 (EUROSTAT 2005). It is also noted that such share has become significantly lower than the average of EU25, which was relatively stable at 10% since the end of 90s. Among the three countries of this study, EUROSTAT data shows that in Czech Republic and Estonia, the share of chemical industry has declined to even lower, around 5%, than in Poland.

Conversely, the number of employees in the chemical industry decreased from about 140.000 in 1995 to less than 100.000 in 2002 and thereafter. The trend of clearly declining in employment at more than 5 % annually and strong increasing in turnover indicates that the substitution of human workforce, mostly likely accompanied by increased capital-intense automatic production, has been in progress resulting in the evidently improved labour productivity. Since 2002, however, this development seems to have slowed down remarkably.

D.5.1.2 Identification of the specialty chemical sector in Poland

With less information available than the Czech Republic, the overview of the specialty chemical sector in Poland is based on a very limited number of sources. Most of our information was drawn from the website and the annual reports of the Association of the Polish Chamber of Chemical Industry (PIPC) and from the Polish government as presented by EUROSTAT.[11] None of these sources explicitly specifies the specialty chemical sector. Therefore as discussed,, specification and analysis of data are done according to the NACE system.
Table D.15 gives a first hint how the total value added of EUR2.040 million of the chemical industry (NACE 24), its 2241 companies and approximately 120.000 employees are distributed among the different NACE categories. Values for NACE category 25 are given for comparison. The last year explicitly specifying at least the majority of relevant NACE categories is 1999.

Table D.15 Share of the sub-sectors of the chemical industry's turnover, companies and employment in Poland in 1999

NACE category	Subsector	Value added	Number of firms	Employees (1000)[1]

[10] In the 1990s, the exchange rate between the Polish Sloty (PLN) and EUR was characterized by a constant significant devaluation of the former. In 1999, this development was interrupted; since then, the PLN fluctuated around its current rate of about 4.4 PLN per EUR.

[11] Additional information could be gathered in an interview with the Polish Chamber of Chemical Industry (PIPC 2004b)

		(Mio. EUR)		
24	**Chemicals and pharmaceuticals**	**2041.3**	**2241**	**125.1**
24.1	Basic chemicals	707.7	530	45.5
24.2	Pesticides and other agro-chemical products	(~40)[2]	n/a	n/a
24.3	Paints, varnishes, printing ink and mastics	134.6	352	7.9
24.4	Pharmaceuticals, chemicals and botanical products	440.3	208	26.0
24.5	Soap & detergents, cleaning and polishing preparations, cosmetic products	439.9	743	24.6
24.6	Other chemical products	(~200)[2]	n/a	n/a
24.7	Man-made fibres	(~80)[2]	n/a	n/a
25	**Rubber and plastics processing (NACE 25)**	**1370.3**	**9723**	**107.8**

Source: PIPC (2003) and EUROSTAT (2005)
[1] Figures for employees are from 1998; [2] Estimates

Evidently, data are rather fragmentary. With regard to the specialty chemical sector, only NACE categories 24.3 and 24.5 are specified. Their combined shares of the total chemical sector (NACE 24) are 28 (value added), 49 (number of firms)12 and 26 % (employees). For comparison, the corresponding values for the Czech Republic in 2002 were 15 (value added) and 16 % (employees). If rough estimates for turnover in NACE categories 24.2, 24.6 and 24.7 are included in the calculation, the specialty chemical sector specified as the combination of NACE categories 24.3, 24.5 and 24.6 contributes 38 % to the total turnover of the chemical industry, compared with 24 % in the Czech Republic. Another source of data shown in *Table D.16*, provided in an interview with the PIPC (2004b), show that the share of the three categories is 30%. In any case, it appears that the relative importance of the specialty chemical sector as specified here is significantly higher in Poland than in the Czech Republic.

Table D.16 Structure of the Polish chemical industry

NACE	Sector	Share of production value (%)
24.1	Basic materials	49.2
24.2	Pesticides and other agro-chemical products	1.2
24.3	Paints, varnishes and similar coatings, printing ink and mastics	7.1
24.4	Pharmaceutical, medicinal chemicals and botanical products	17.1
24.5	Soaps and detergents, cleaning and polishing preparations, Perfumes and toilet preparations	16.6
24.6	Other chemical products (predominantly specialties)	6.3
24.7	Man-made fibres	2.4
24	**Total**	**100**

Source: PIPC (2004b)

On the other hand, the preponderance in the number of employees (26 % as compared to 16 % the Czech Republic) is similar to that of turnover or value added (24.6 as compared to 14.5 %), the productivity of labour in the specialty chemical sector in Poland seem to resemble that in the Czech Republic.

D.5.1.3 Economic performance of the specialty chemical sector

[12] The large relative number of firms indicates that firms in the speciality sector are in average smaller than those in the entire chemical industry. Due to the large diversity and lower tonnage of specialty chemical, this effect is not surprising.

Like in the previous case study, a set of indicators is used to describe the performance and recent development of the specialty chemical sector in Poland as compared to the performance and development of the chemical industry as a whole.

Table D.17: Turnover (sales) of chemical products in Poland, 1998 to 2002

(Million EUR)	1998	1999	2000	2001	2002
NACE 24.1	2561.1	2400.1	3093.2	3223.1	3025.8
NACE 24.2	n/a	n/a	n/a	n/a	n/a
NACE 24.3	503.9	530.0	(530)[1]	(530)[1]	528.6
NACE 24.4	1068.1	1092.2	1303.3	1653.0	1889.9
NACE 24.5	1831.3	2050.9	2246.2	2723.1	3002.4
NACE 24.6 + 24.7	n/a	n/a	n/a	n/a	n/a
NACE 24	**6738.0**	**6816.3**	**8131.5**	**n/a**	**8424.1**
Cumulative index	100.0	101.2	120.7	n/a	125.0
Specialty chemicals[2]	**2335.2**	**2580.9**	**2776.2**	**3253.1**	**3531.0**
Cumulative index	100.0	110.5	118.9	139.3	151.2

Source: EUROSTAT (2005), PIPC (2003) and personal calculation
[1] Estimates; [2] NACE 24.3 + 24.5

Table D.17 shows that in the period from 1998 to 2002, the relative share of specialty chemicals in terms of turnover grew from 35 to 42%. The development in the specialty chemicals sector looks also favourable when the value added is considered. *Table D.18* shows that the contribution of the specialty chemical sector to the value added of the total chemical sector grew from 29% in 1998 to about 37% in 2002.The difference in growth rate between specialty and total chemicals is reported to be significant in both turnover and value added. Over the same time period, the turnover of specialty chemicals grew at an average of 11%, nearly twice as much as the Polish chemical industry, and the same trend can be observed by looking at the growth rate of the value added. Therefore, the specialty chemical sector grew significantly faster than the chemical sector. It can also be noted that a more significant position of the specialty chemical sector in Poland as compared to the Czech Republic is confirmed not only in static, but also dynamic terms.

Table D.18: Value added of the Polish chemical industry, 1998 to 2002

(Million EUR)	1998	1999	2000	2001	2002
NACE 24.1	705.7	707.7	900.8	1130.0	770.9
NACE 24.2	n/a	n/a	n/a	n/a	n/a
NACE 24.3	114.4	134.6	161.5	n/a	(200)[1]
NACE 24.4	440.3	481.1	566.9	1036.0	840.7
NACE 24.5	439.9	513.4	625.2	1399.6	765.1
NACE 24.6 + 24.7	n/a	n/a	n/a	n/a	n/a
NACE 24	**1936.5**	**2041.3**	**2491.6**	**n/a**	**(2600)[1]**
Cumulative index	100.0	105.4	128.6	n/a	(134.2)[1]
Specialty chemicals[2]	**554.3**	**648.0**	**786.7**	**n/a**	**(965.1)[1]**
Cumulative index	100.0	116.9	141.9	n/a	(174.1)[1]

Source: EUROSTAT (2005), PIPC (2004b) and personal calculation
[1] Estimate; [2] NACE 24.3 + 24.5

In some contrast to the latter figures, employment in the specialty chemical sector shows only a marginal increase, while the number of employees in the entire chemical industry decreased by an average of more than 6 % (see *Table D.19*). This corresponds to an increase in the specialty chemicals sector's employment share from 26% in 1998 to 34% in 2002. These percentages are in agreement with the share of value added and its increase, which implies that the relative changes in the productivity of labour in both specialty chemical sector and chemical industry are

approximately the same. Moreover, the fact that average annual increases in value added (15 and 8% for specialty chemicals and chemical industry respectively) were significantly higher than those of employment (0.4 and -6.2 % respectively) indicating that the productivity of labour must have undergone a substantial increase. This is indeed shown in
Table D.20. Remarkably, with an average of more than 14% annually, not only the increase in productivity in Poland is much higher than in the Czech Republic (with hardly 5 %); also the absolute productivity achieved in 2002 in Poland is 60 % higher in the specialty chemical sector and 6 % higher in the entire chemical industry (compare *Table D.11* and *Table D.20*).

Table D.19: Number of employees in the Polish chemical industry, 1998 to 2002

(1000 Employees)	1998	1999	2000	2001	2002
NACE 24.1	45.5	n/a	n/a	n/a	31.6
NACE 24.2	n/a	n/a	n/a	n/a	n/a
NACE 24.3	7.9	n/a	n/a	n/a	(8)[1]
NACE 24.4	25.9	n/a	n/a	n/a	25.8
NACE 24.5	24.6	n/a	n/a	n/a	25.1
NACE 24.6 + 24.7	n/a	n/a	n/a	n/a	n/a
NACE 24	**125.1**	**120**	**109**	**103**	**97,0**
Cumulative index	100.0	95.9	87.1	82.3	77.5
Specialty chemicals[2]	**32.5**	n/a	n/a	n/a	**33.1**
Cumulative index	100.0	n/a	n/a	n/a	101.8

Source: EUROSTAT (2005), CEFIC (2005) and personal calculation
[1] Estimate; [2] NACE 24.3 + 24.5

Table D.20: Productivity of the labour (value added per number of employees) in the Polish chemical industry, 1998 to 2002

(1000 EUR/employee)	1998	1999	2000	2001	2002
NACE 24	**15.5**	**17.0**	**22.9**	**n/a**	**26.8**
Cumulative index	100.0	109.7	147.7	n/a	172.9
Specialty chemicals[2]	**17.1**	**n/a**	**n/a**	**n/a**	**29.2**
Cumulative index	100.0	n/a	n/a	n/a	170.8

Source: personal calculation from *Table D.18* and *Table D.19*.

However, it should be noted that, unlike in the Czech Republic, the stronger increase of both specialty chemical and chemical industry in Poland cannot be interpreted as an indication for a catch-up reaction from a lower level. Instead, in 2002, the productivity in the Polish specialty chemical sector (29.2 kEUR/employee) had exceeded the productivity in the chemical industry in Poland (26.8 kEUR/employee) as well as in the Czech Republic (ca. 25.2 kEUR/employee). This increase in productivity as well as the expansion of the specialty chemicals sector in general implies that at least on the domestic market, the competitiveness of the specialty chemicals sector should be quite strong. It remains to be seen whether this finding is confirmed by, and can be extended to, foreign markets.

D.5.1.4 Foreign trade

Like the Czech Republic, Poland also shows a large deficit in foreign trade of which the major part is due to the chemical industry and its products. As shown in

Table D.21, 40 % of the chemical industry's sales go into export, whereas chemical products worth 88 % of these sales are imported. This yields a foreign trade performance of -0.37 for Poland, which is quite similar to the Czech figure of -0.35.[13]

Table D.21: Foreign trade in products from chemical industry in Poland (in current prices) in 2003

(Million EUR)	Export	Import	Trade balance	Export dynamics 2003/2002	Import dynamics 2003/2002
Inorganic chemicals	247.5	304.2	-56.7	127.1	121.4
Organic chemicals	496.1	973.2	-477.1	130.6	129.4
Fertilizers	273.8	160.2	113.6	178.6	105.2
Pharmaceuticals	189.2	2077.1	-1887.9	112.6	115.5
Pigments and dyes*	188.6	778.8	-590.2	131.0	126.1
Glues, enzymes*	69.6	241.2	-171.6	113.9	114.2
Soap detergents*	311.2	363.7	-52.5	138.0	118.3
Cosmetics*	508.6	504.5	4.1	143.1	121.5
Photo chemicals*	6.2	127.8	-121.6	131.9	118.0
Synthetic rubber	947.7	880.8	66.9	139.8	134.1
Other chemicals	160.0	965.1	-805.1	132.5	119.8
All chemicals	**3398.5**	**7376.6**	**-3978.1**	**133.9**	**119.9**
Specialty chemicals*	**1084.2**	**2016.0**	**-931.8**	**137.6**	**121.6**

Source: PIPC (2005), modified and personal calculation
* Specialty chemicals
[1] including paints and varnishes (supposed)

The deficit grew strongly by more than 15 % annually from 1995 to 2001 and more slowly only in recent years (CEFIC 2005). In 2003, the export and import of specialty chemicals contributed to 32 and 27% of that of all chemical products respectively, and the share of specialty chemicals in the total trade deficit of chemical products was 23%, which is significantly less than their contribution to turnover (42%) or value added (37%). From 2002 to 2003, both export and import of specialty chemicals showed a more dynamic increase than export and import of chemical products in general. However, the export grew much stronger than the import of specialty chemicals. This has resulted in the share of specialty chemicals in total trade deficit reduced to less than 10 % in 2002/2003. This can be seen as another indication for a relatively better competitiveness of the Polish specialty chemical sector.

However, again the question arises: why is the Polish chemical industry rather competitive in producing specialty chemicals but not bulk chemicals and pharmaceuticals? Specialty chemicals are qualitatively more heterogeneous allowing for a wide variation of input factors. Since the manufacturing of specialty chemicals is more labour-intense, the less costly workforce in Poland allows for cheaper production than in economically more advanced countries, even with slight decreases in quality as less expensive alternatives for the market. By contrast, bulk chemicals are produced in highly automatic production devices which would be economically viable only when applied in sufficiently large scales. Moreover, due to a lower degree of vertical integration, Polish manufacturers of bulk chemicals often rely on input material supply by other firms – often from abroad. This renders production more costly than in countries with a higher degree of vertical integration (DG Enterprise 2000).[14]

[13] Trade performance = (export – import)/(export + import)

[14] In the Czech chemical industry, by contrast, the company Spolchemie is given as an example for a high degree of vertical integration in the production of resins and sufficiently large production facilities that allow for production at low costs (DG Enterprise 2000).

Another important aspect is the partners involved in foreign trade. In the time period 1998 to 2002, more than half of the exports of the chemical industry go to EU-15 with increasing tendency, exports to CEFTA countries (Czech Republic, Hungary, Slovakia, Slovenia, Romania, Bulgaria) and the former Soviet Union declined from 40 to 20% and exports to other (developed) countries were in the order of 10%. With a share of almost three quarters, imports are even more EU-15-biased, whereas the shares of the CEFTA countries, the former Soviet Union, developing countries and the remaining (developed) countries are all in the range of between 5 and 10 % (see *Table D.22*).[15] Although specific data on foreign trade for specialty chemicals are lacking in the Polish case, it can be expected that, like in the Czech Republic, the exports of specialty chemicals are significantly more CEFTA-focussed, whereas on the import side, no major changes are expected because the bias in favour of the EU is already quite strong.

Table D.22: Exports and imports of chemicals by main territories in the period 1998 to 2002 (in %)

	1998	1999	2000	2001	2002
Export structure					
EU	50.3	54.3	55.3	52.6	69.0
CEFTA	11.6	13.6	13.9	14.2	8.7
Former SU	28.3	21.6	19.9	22.5	10.3
Developing countries	5.2	7.7	7.3	6.4	6.0
Other	4.6	2.9	3.6	4.3	6.0
Import structure					
EU	72.8	74.2	73.7	73.2	62.0
CEFTA	8.7	8.5	8.5	8.7	7.3
Former SU	2.8	3.0	3.4	4.0	10.0
Developing countries	6.0	4.7	5.2	4.9	12.3
Other	9.7	9.5	9.2	9.3	8.4

Source: PIPC (2004)

With regard to the potential impact of REACH, two effects may be foreseen. On the one hand, exports to countries outside the EU-25 (including part of the CEFTA countries), that is between one quarter and one third of the export volume, will most likely be negatively affected. For Poland, this share is significantly higher than for the Czech Republic (about 20 %). On the other hand, it is expected by several interview partners that REACH will render it more difficult to maintain imports of raw materials, on which Poland depends more heavily than the Czech Republic. It is not possible to be investigate in this study whether or not these substances would be registered by their importers, however, if they are to be registered,, it is believed that for reasons of administration and enforcement, it would be difficult for the importers to form consortia with other EU manufacturers/importers and as well difficult to obtain information from suppliers outside the EU for self registration. Due to the lower degree of vertical integration in the Polish chemical industry, this problem also applies to the specialty chemical sector.

D.5.1.5 Conclusions from statistical data analysis

At first glance, the future perspectives of the Polish chemical industry (NACE 24) in general and the specialty chemical sector in particular seem to develop respectable, even though it has been slight slower than the manufacturing industry as whole. With regard to the less pronounced period of stagnation in the near past and the higher growth rates together with an equally high productivity, the situation looks even slightly better than in the Czech Republic. However, there are also some drawbacks especially with regard to the implementation of REACH. The stronger reliance of the Polish (specialty) chemical sector on raw material imports from outside the EU increases the risk of non-availability of these substances after the implementation of REACH.

[15] For exports as well as imports it is unclear whether the sudden shifts in the year 2002 represent real changes in tendencies or are merely one-time outliers.

Moreover, the lower degree of vertical integration and the organisational structures between chemical companies in Poland do not facilitate the implementation of REACH. Certain measures of restructuring in terms of foreign trade as well as information flow could well lead to an improvement.

D.5.2 Company analysis

Four companies have been interviewed for the Polish case study. One interview was performed with the holding in Germany, but all given information are for the affiliate firm in Poland. The companies in Poland have been selected and contacted by the Polish chamber of chemical industry association (PIPC). One company was conveyed by the European association Eurocommerce. Not all the selection criteria established by methodology were followed due the problems of acquisition of companies for participation in the study. However, all four companies are involved in the business of specialty chemicals, and their products represent a high share of their respective market in Poland.

D.5.2.1 Characterisation of interviewed companies

Two of the companies are manufacturers of substances, one is a formulator with a few substances produced, and one is an importer of chemicals. In total the four companies represent 4.5 % of the turnover of the Polish chemical industry with together 3514 employees. All three manufacturing companies are large companies, with a number of employees far above the criteria of 250, which holds for SME. The Polish affiliate of the importer is a small store with less than 10 employees.

The privatisation of two companies has been completed; the other two are still treasury owned. Main business of the producing companies is fertilizers, plasticizers, explosives, engine coolants and fuel additives.

D.5.2.2 Economic situation and product portfolio

Export of their products is of considerable importance for the three manufacturers. Almost 45% of turnover is exported. Two companies have relatively high share of export to non-EU market, with export accounting for over 20% and 13% of their respectively turnover, while in the other two companies export to non-EU does not play a role. Overall export to non-EU markets amounted to 18% of turnover of the interviewed companies. All companies stated that the accession to the European Union has affected market conditions, product portfolio and process technology. The competitive pressure from Western companies on the domestic Polish market has increased dramatically. For one company this resulted in shrinking EU trade and increasing trade with Eastern non-EU neighbours.

The growth rates of all companies are at 8 to 46% in the year 2003. In the average, turnover of the four companies has expanded in the last year by 26%. Wages of workers in production stays below 4 EUR per hour, a considerable advantage in the competition with EU-15 countries. Overall, profit margin is at 2% of turnover with two companies having only 1% of profit margin.

For all companies raw material is by far the most important cost factor in production. Over all companies, purchase of raw materials occupies 58% of total production costs. Apart from the feedstock, e.g. natural gas, some raw materials are reported to originate from non-EU Eastern Europe, however, from the information gathered with the interviewed companies, it is not possible to estimate the dependency of companies on these raw material sources. By contrast, three companies reported that the costs of personnel have been below 6% of the total cost, one manufacturer reported a personnel costs share of 25%.

In total, the companies reported production of 112 preparations and 34 substances and intermediates. It should be noted that these figures do not represent the entire product portfolio

of the interviewed companies, since the companies have selected the substances for the case study and in many cases only provided the information relating to these substances. The share of specialty chemicals in the total turnover is reported in the range of 16% to over 70% in the three interviewed manufacturers. Information gathered from the formulator indicates that the use of substance is at an average of 20 preparations per substance. If only substances below a production volume of 100 tons per year are considered, the formulator has to reformulate 4 preparations in case of withdrawal of a substance. Like in the other case studies, the average figure highly depends on the type of substances, thus the effect of substance withdrawal on number of preparations should be analysed on a case by case basis.

D.5.2.3 Accession impact and HSE management

In all companies the implementation and enforcement of the Acquis communautaire is almost complete. The implementation of the chemical Acquis did neither cause major efforts nor excessive costs. In contrast, the heavy investment due to IPPC directives absorbed considerable financial and managerial resources. In this field implementation is still ongoing.

The EU provisions on SDS are fully implemented in all companies. No useful information was given by the companies to assess the number of SDS managed and maintained by one person. Chemicals inventory databases are in use, but only partly able to link the substances in question to suppliers and individual workplaces. One company even does not have such a system. ISO 9000 and ISO 14000 are usually implemented. None of the companies hold an EMAS certification.

The frequency of controls through responsible inspectorates is rather high. Therefore, compliance with environmental legislation ranks high on the company's agendas. Although some of the companies have own laboratories to monitor compliance with environmental standards, some testing had to be outsourced. This need to use external testing facilities was of concern for all companies.

Two companies reported the need for chemicals substitutions because of external requirements. This was at least partly driven by impacts of the chemicals on human health and the environment.

D.5.2.4 Innovation performance

Information on the R&D budget was only given by two companies, one with 0.01% and the second with 0.8% of turnover. Excluding the importer, who has no R&D department in his Polish affiliate, 25 persons in three companies are concerned with R&D, this is 0.7% of their total employees. Whereas in the Czech Republic at least the share of the R&D staff from total employees come close to EU-15 standards, in the interviewed companies both indicators, i.e. budget and staff, are well below EU-15 standards.

For two companies, research contracts with universities are quite common, but this probably is not always be the case for the majority of Polish SME in the specialty chemical sector. The interviewees stressed the need to shift the product portfolio to higher value-added products. However, this goal is yet to be implemented into business planning. Product innovations don't play a role, the rare R&D resources are currently directed to product improvements. Only two new products have been developed in the recent past, one in each of two companies, triggered by environmental considerations. None of the companies has registered a patent in the last years.

Overall market reactions on price increase are said to be negative, and the companies see little opportunities to pass on costs to their customers. On the domestic market, if a company’s product dominate the respective market, cost pass on is not impossible, especially when the product price is competitive comparing to the imported price, however for other producer of the same product, they would have to follow the market.

The impacts of REACH on innovation performance are expected to be negative in all interviewed companies. Shift of R&D resources to substance testing, and time consuming engagement of staff for registration of substances and their uses, impeding flexible reactions on market needs, were mentioned as reasons for that.

Cooperation with downstream users in the development of preparations is important for two companies. The formulator states to regularly cooperate with his substance supplier in R&D.

D.5.2.5 Strategies to cope with REACH

Information on REACH has mainly been received from industry associations. All companies feel to be informed insufficiently. The knowledge of the REACH proposal is weak in all interviewed companies. Two are relatively well informed, whilst the others have very limited understanding. None of the companies know reliably the costs for registration, nor how intellectual property rights are tackled in this context and what information will have to be collected under REACH along the supply chain. The companies did not know the REACH information sources of the Commission in the internet.

One company assessed its product portfolio for REACH impacts, one company did it for selected products; the others made no such assessment. The importer stated that he doesn't see a problem in joining consortia for substance registration.

Concerns over REACH are that EU-15 companies will use it to gain competitive advantages, that animal tests required under REACH are not allowed under Polish legislation, high cost impacts of registration, and increasing bureaucracy. For none of the companies a relocation of production outside EU is a strategy to avoid REACH burdens. Strategies to deal with REACH have not been developed by any of the companies.

All companies have been and some still are operating in a difficult environment, with challenges ranging from privatization, over increasing competition from EU-15, to insufficient profits and financial flexibility. In this context REACH is perceived by the companies as one additional burden, although it is not, for the time being, considered as high priority.

D.5.3 REACH impacts on selected chemicals

A full value chain analysis including down stream users could not be carried out, because the interviewed companies expressed concerns to discuss REACH with their customers, who have very little information on chemicals policy. The companies feared in particular misunderstandings when discussing potential price increases with their clients.

The choice of substances for the study reflects the concerns of the companies on the possibility of stopping production. No analysis was carried out for the portfolio and specific substances of the importing company, as not sufficient data was available with regards to production volumes at the level of substance suppliers.

Data given by the companies allow NPV calculation for seven substances, including two intermediaries. However, three substances, all final products, are selected by the companies for detailed assessment. All three substances, i.e. substance A, B, and C described below, were selected by the companies as key products for the vulnerability analysis, and for the chemical synthesis of these three substances, information was provided on additional nine substances as the key raw material. All three substances are large volume organic specialty chemicals with production volumes from 7.000 to more than 60.000 tonnes. The raw material substances are petrochemicals, either produced on-site or purchased, with large volume on the market. Cost impacts due to REACH registration were assessed on both product substances as well as the raw material substances assuming a 100% costs pass down.

Data and information from the interviews was incomplete which made it necessary to work with scenarios when assessing a number of substances produced by the companies as well as substances used in the synthesis production.

Companies provided the **prices** for all three substances, which lies between 0.5Euro/kg and 1Euro/kg. None of the interviewed companies provide data on **payback time and discount rates**. They all accepted as a reasonable hypothesis the values of 4 years and 8%, as proposed in the methodology.

Two substances, reported as substances with high potential and/or dominant market position, had negative **substance profit margins** in the data reporting year, but in both cases the situation, according to the companies, was expected to be reversed in the near future. For the third substance the substance profit margin was not available.

For the three companies the average company profit margins were available. However, in all cases the figure did not seem to be representative for the substance assessed, due to their specific nature within company portfolio (e.g: in a company with more than 80% fertiliser production and less than 20% specialties, the average company profit margin is not representative for the specialty products, as these normally have a several times higher profit margin than fertilisers). In some occasions average profit margin were considered higher, and in others lower.

Taken into account all this information it was decided to use for the purpose of the report 8% as representative profit margin for all the substances. This figure is consistent with the information available for substance with positive profit margin. It had also been considered reasonable in the methodology discussions of the Working Group. Another important reason was to avoid disclosing confidential information, in particular regarding those companies that today are loosing money with two substances that they consider particularly important, and for which they expect profits in the near future. In the report both things appear, but the link is not made evident.

In the following, the NPV is therefore calculated with 8% profit margin. However, calculation of NPV using substance or company average profit margin was also made. The general results do not change.

Substance A

Substance A is a high volume substance with production of more than one million tonnes per year in EU. According to the Council Regulation (EEC) 793/93, it is included in the priority list as dangerous substance. Assuming that a four-year payback time of four, discount rate at 8% and profit margin of an average of 8%, the result of the NPV calculation is positive and the price is estimated to increase by 1.4% due the direct cost of REACH registration as well as the indirect cost of REACH registration of the raw materials. NPV calculation with the company average profit margin also led to a positive NPV. Currently many producers of the substance are registered in EU, therefore it is possible that the cost of registration will be shared through consortia. Cost pass down will be highly depending on the price strategy of other producers. However, in the reporting year the substance has a negative profit margin, and is considered to be vulnerable to REACH if the situation persists. Furthermore, the substance may be subjected to authorisation under REACH.

Substance B

Substance B is a high volume substance with production of more than one million tonnes per year in EU. According to the Council Regulation (EEC) 793/93, it is included in the priority list as dangerous substance. With the 8% substance profit margin assumption, which is close to the company's investment criteria, the result of the NPV calculation is positive and the price is estimated to increase by 0.6% due the direct cost of REACH registration as well as the indirect cost of REACH registration of the raw materials. NPV calculation with the company average profit margin also led to a positive NPV. Currently many producers of the substance are registered in EU, therefore it is possible that the cost of registration will be shared though consortia. Cost pass down is highly possible though it is not necessary since the price increase is negligible. However, in the reporting year the substance has a negative profit margin, and is considered to be vulnerable to REACH if the situation persists. Furthermore, the substance may be subjected to authorisation under REACH.

Substance C

Substance C is a high volume substance with production of more than one million tonnes per year in EU. With the 8% substance profit margin assumption, the result of the NPV calculation is positive and the price is estimated to increase by 1% due the direct cost of REACH registration as well as the indirect cost of REACH registration of the raw materials. NPV calculation with the company average profit margin also led to a positive NPV. Currently six producers of the substance are registered in EU, therefore it is possible that the cost of registration will be shared though consortia. Cost pass down will depend on the other producers on the EU market, though it is not necessary since the price increase is negligible and company is relative competitive.

D.5.4 Conclusions from country case Poland

The results of the interviews show that, for the assessed companies, significant impacts on the competitiveness of the selected companies due to REACH are not likely. Two substances analysed in this study have negative profit margin which makes NPV calculation meaningless. The third substance is not endangered by withdrawal due to costs triggered by REACH.

As expected, the larger the production capacity of the analysed specialty chemicals, the easier the absorption of registration cost. Consequently, a supplier of the same product with lower production capacity may lose more of its profit, if large producers decided not to increase price above its cost burdens.

The impact of REACH on innovation budget is expected to be negative according to the companies, since it is thought that REACH implementation will divert the resources. This statement has to be seen in the context that the interviewed companies have already very reduced innovation budgets due to a number of different reasons which are not related to chemicals legislation. Against this background and taking into account that no major cost caused by REACH will be imposed on the companies according to calculations made, it seems that, indeed, there are and will be negative impacts on innovation in the interviewed companies, but that these are related only to a minor extent to REACH.

Companies in general do not foresee problems of REACH implementation in terms of HSE management and requirement due the extensive effort made before the accession, which puts them into a better position than a lot of EU-15 companies. However, they are worried about the administrative aspects of the regulation which they fear would lead to excessive bureaucracy.

Concerning strategic responses to REACH, the companies had not developed plans how to address the issue. The main reason is that REACH as a regulation which will enter into force in 2007 at the earliest is not considered as the current priority of the company, even though its importance is acknowledged. This is not only because of the lack of strategic foresight, but also due to the fact that the interviewed companies are confronted with challenges which they see to be more urgent. Amongst the ongoing privatisation and restructuring takes a prominent position of two company's agenda, the compliance with environmental legislation, and the increasing competition from EU-15 companies felt by the companies. However, the question of relocation to non-EU countries or withdrawal of processes and products was no issue for any of the interviewed companies.

All the interviewed companies had knowledge of REACH to a certain extent, not the least because they had been contacted by the Polish Chamber of chemical industry PIPC for the participation in this project. It is difficult to conclude from the sample of four companies to the general state of knowledge in the Polish chemical industry. However, from discussion with the companies' staff and with PIPC it is likely that the companies in general just start to get familiar with REACH. Obviously it was difficult for the companies to get access to information sources, as in the interviews various misunderstandings concerning the details of REACH had to be clarified.

D.6 Estonia

D.6.1 The specialty chemical sector

D.6.1.1 The Estonian chemical industry – an overview

With 1.4 million inhabitants, Estonia has got little more than one thirtieth of the population of Poland. Accordingly, its economic power is reflected in a GDP of just EUR 7,500 million in 2002, to which the manufacturing sector contributed a value added of EUR 1,140 million or 15%. This share is lower than in Poland (19%) and much lower than in the Czech Republic (23%), indicating a significantly lower degree of the significance of industry in Estonian economy. In the same period, the manufacturing of chemicals and pharmaceuticals (NACE 24) and the processing of rubber and plastics (NACE 25) contributed 4 and 3% respectively, yielding a total of EUR 82 million, to the value added of the manufacturing sector. At the same time, the contributions of these two sectors to the turnover of the total manufacturing sector were 5 and 3.5% respectively, yielding a total EUR 368 million. Accordingly, the chemicals and pharmaceuticals products gave rise to a turnover of about EUR 212 million and contributed 0.6% or EUR44 million to the GDP of the whole Estonian economy (EUROSTAT 2005) – significantly less than that in the case of Poland (1.3%) and the Czech Republic (2.1%).

Unlike the rubber and plastics processing sector, which grew significantly by an average 22% per annum between 1996 and 2002, the manufacturing of chemicals and pharmaceuticals (with the exception of a slump in 1999/2000) experienced stagnation in the same period. Compared to the development of the entire manufacturing sector which grew by an annual average of 13% in this time period, the development of the chemical industry , as NACE 24, was characterised by a decline at the same rate (-13%). Even though the value added grew slowly during the same period (a yearly average of less than 2.5%), employment underwent a slight decrease of 4% annually (EUROSTAT 2005).

D.6.1.2 Identification of the specialty chemical sector in Estonia

As in the preceding country studies, neither the Statistical Office of Estonia nor EUROSTAT explicitly mention the specialty chemical sector. Instead, specification of data is again made according to the NACE system (EUROSTAT) or the NACE-equivalent CPA and the SITC classification (Statistical Office of Estonia). *Table D.23* gives a first hint as to how the total value added of EUR44 million of the chemical industry (NACE 24), its 78 companies and roughly 3000 employees are distributed among the different NACE categories. Values for NACE category 25 are given for comparison.

Table D.23 Share of the sub-sectors of the chemical industry's turnover, companies and employment in Estonia in 2002

NACE category	Subsector	Value added (EUR million)	Number of firms	Employees
24	**Chemicals and pharmaceuticals**	**44.1**	**78**	**2942**
24.1	Basic chemicals	5.9	15	976
24.2	Pesticides and other agro-chemical products	n/a	2	n/a
24.3	Paints, varnishes, printing ink and mastics	19.7	13	529
24.4	Pharmaceuticals, chemicals and botanical products	n/a	14	n/a
24.5	Soap & detergents, cleaning and polishing preparations, cosmetic products	2.4	23	286
24.6	Other chemical products	10.3	11	858

24.7	Man-made fibres	0.0	0	0
25	**Rubber and plastics processing (NACE 25)**	**37.9**	**131**	**3384**

Source: EUROSTAT (2005)

With regard to the specialty chemical sector, all relevant NACE categories (i.e. 24.3, 24.5 and 24.6) are specified. In comparison with the chemical products (NACE 24), their combined shares are 73% (value added), 60% (number of firms) and 57% (employees). For comparison, with 22, 24 and 35 %, the respective figures for the Czech Republic were much lower. This discrepancy is even larger due to the lack of appropriately specified data in the Czech statistics, and the latter percentages additionally comprise NACE category 24.7.

Unlike the Czech Republic, a comparison with Poland can only be made on the basis of the combined shares of NACE categories 24.3 and 24.5. But also in this case, the share in value added of the specialty chemical sector in Estonia (50%) is much larger than in Poland (28%). By contrast, the specialty chemical sector's shares in the number of firm (49 vs. 46%) and employment (26 vs. 28%) were quite similar. So, it appears that, although the degree of industrialisation in Estonia as measured by the contribution of the manufacturing sector to the country's GDP is relatively low, the relative importance of the specialty chemical sector within the Estonian chemical industry is higher than in Poland and much higher than in the Czech Republic.

D.6.1.3 Economic performance of the specialty chemical sector

Turnover, value added and employment are considered as indicators for describing the performance and recent development of the specialty chemical sector compared to the chemical industry as a whole. Unfortunately, however, data about the temporal development of these performance indicators are very incomplete because, first, data on the 3-digit NACE sub-sector level were not collected at all prior to the year 2000 and, secondly, many data were kept confidential. As a consequence, the data set of the year 2002 (shown in *Table D.23*) is the first and, so far, only one allowing for a comprehensive specification of the specialty chemical sector. Nevertheless, some conclusions can even be drawn from the poor existing data.

For instance, 3-digit NACE-specified firm numbers available for the complete period 2000 to 2003 (see *Table D.24*) indicate that, at least in terms of firm numbers, the share of (mainly) specialty chemical firms remained constantly on the high level described above.

Table D.24: The number of firms of chemical industry in Estonia, 2000 - 2003

(Million EUR)	2000	2001	2002	2003
NACE 24.1	15	15	15	22
NACE 24.2	1	1	2	15
NACE 24.3	16	15	13	17
NACE 24.4	15	15	14	13
NACE 24.5	16	14	23	22
NACE 24.6	15	9	11	31
NACE 24.7	0	0	0	0
NACE 24	**78**	**69**	**78**	**120**
Specialty chemicals[1]	**47**	**38**	**47**	**70**
Specialty chemicals/NACE 24	0.60	0.55	0.60	0.58

Source: EUROSTAT (2005), EKTL (2005)

[1] NACE 24.3 + 24.5 + 24.6

A more indirect indication for the persistent significance of the specialty chemical sector consists of the fact that the manufacturing of basic chemicals (NACE 24.1), the only sub-sector for which complete data from 2000 to 2002 are available, shows a slight decrease rather than increase in terms of turnover, value added and employment and, while representing one third of

the employees and one fourth of the turnover of the chemical industry, does not go at the expense of the specialty chemical sector.

In order to assess the competitiveness of the Estonian specialty chemical sector in the international context, the productivity expressed as value added per full-time equivalent employee is again used as an indicator. As it is clearly evident from *Table D.25*, the productivity in the Estonian specialty chemical sector (EUR 11,900 per employee) is not only considerably lower than in Poland (EUR 29,200) and the Czech Republic (EUR 18,000); it is also significantly lower than in the entire chemical industry (EUR 15,900). Unfortunately, on the basis of the data available, it is impossible to assess whether and how the specialty chemical sector may possibly develop from this rather low basis. In this rather negative productivity assessment, also one positive exception needs to be emphasized: the manufacturing of paints and varnishes (NACE 24.3) shows a productivity of EUR 37,700 per employee, which is significantly higher than the corresponding figures for Poland (EUR 25,000) and the Czech Republic (EUR 17,800).

Table D.25: Productivity of labour (value added per employee) in the Estonian chemical industry, 2000 to 2002

(1000 EUR / Employee)	2000	2001	2002
NACE 24.1	5.4	8.0	6.1
NACE 24.2	n/a	n/a	n/a
NACE 24.3	n/a	n/a	37.7
NACE 24.4	n/a	n/a	n/a
NACE 24.5	n/a	6.9	8.8
NACE 24.6	n/a	n/a	12.1
NACE 24.7	0	0	0
NACE 24	**11.5**	**15.2**	**15.2**
Specialty chemicals[1]	**n/a**	**n/a**	**11.9**

Source: EUROSTAT (2005) and personal calculations
[1] NACE 24.3 + 24.5 + 24.6

Summarising the above results, the specialty chemicals sector in Estonia assumes a high, constant share of the production and employment of the chemical industry which, in turn, is unable to participate in the steady growth of the manufacturing sector in general. With one exception, the productivity of labour is low. However, the lack of dynamics of the chemical sector is evident. Low value-added or productivity is not always necessarily a problem as long as a sufficiently strong trend is able to improve the position. Although the data presented do not allow to draw a definitive conclusion, a positive trend can hardly be perceived for the (specialty) chemical sector of Estonia.

D.6.1.4 Foreign trade

In Estonia, the relative contribution of the chemical industry (EUR 308 million in 2003) to the total Estonian trade deficit (EUR 2,066 million) is about 15% smaller than that in Poland. This is in part due to the lower contribution of the chemical industry to the country's GDP.

Export of chemical products from Estonia in 2002 represented 121% of the corresponding sales of chemical industry. This fact can be explained by large quantities of chemical products being exported immediately after import by Estonian trading companies. In particular, this applies to basic chemicals, of which the equivalent of EUR 138 million is exported while only EUR 50 million is produced. On the other hand, chemical products worth 267% of the sale of domestic products are imported (see *Table D 26*). This yields a foreign trade performance of -0.37, which is similar to both the Polish (-0.37) and Czech estimation (-0.35).[16]

[16] Trade performance = (export – import)/(export + import)

Table D.26: Development of foreign trade in chemical products in Estonia (in current prices), 2000-2003

Total exports (EUR million)				
CPA[1]	2000	2001	2002	2003
CPA 24.1	160.44	148.31	137.87	172.34
CPA 24.2	0.79	1.14	1.10	0.67
CPA 24.3	33.31	60.39	72.30	86.80
CPA 24.4	25.04	24.42	22.83	22.06
CPA 24.5	5.24	8.68	9.54	13.26
CPA 24.6	11.46	11.66	13.93	16.78
CPA 24.7	0.62	0.62	0.27	0.35
CPA 24	**236.89**	**255.22**	**257.85**	**312.26**
Cumulative index	100.0	107.7	108.9	131.8
Specialty chemicals[2]	**50.01**	**80.73**	**95.77**	**116.84**
Cumulated index	100.0	161.5	191.5	233.7
Total imports (EUR million)				
CPA[1]	2000	2001	2002	2003
CPA 24.1	199.22	188.92	186.47	226.17
CPA 24.2	5.69	7.70	10.34	10.16
CPA 24.3	54.84	55.14	65.04	73.46
CPA 24.4	88.43	101.17	110.83	112.55
CPA 24.5	60.49	89.99	98.77	97.30
CPA 24.6	53.64	71.65	74.65	79.03
CPA 24.7	14.46	16.73	20.71	21.39
CPA 24	**476.78**	**531.31**	**566.80**	**620.07**
Cumulative index	100.0	111.4	118.9	130.0
Specialty chemicals[2]	**168.97**	**216.78**	**238.45**	**249.79**
Cumulative index	100.0	128.3	141.1	148.2
Net balance (EUR million)				
CPA[1]	2000	2001	2002	2003
CPA 24.1	-38.78	-40.61	-48.60	-53.83
CPA 24.2	-4.91	-6.56	-9.24	-9.48
CPA 24.3	-21.53	5.25	7.26	13.33
CPA 24.4	-63.39	-76.75	-87.99	-90.49
CPA 24.5	-55.25	-81.30	-89.23	-84.03
CPA 24.6	-42.18	-59.99	-60.72	-62.26
CPA 24.7	-13.84	-16.11	-20.44	-21.04
CPA 24	**-239.89**	**-276.09**	**-308.95**	**-307.81**
Speciality chemicals[2]	**-118.96**	**-136.05**	**-142.68**	**-132.96**

Source: Statistical Office of Estonia (2005) and personal calculations
[1] CPA is the consumer counterpart of NACE; [2] CPA 24.3 + 24.5 + 24.6

Between 2000 and 2003, both exports and imports of chemical products (NACE 24) grew by an average of 10% annually; due to the large excess of imports, however, the deficit followed the same trend. In 2000, specialty chemicals contributed to, 21 and 35%, respectively, the export and import of chemical products, making up their contribution to the total deficit being almost 50%, however, less than their contribution to turnover (68%) or value added (73%). From 2000 to 2003, both the export and import of specialty chemicals showed a more dynamic increase than the export and import of chemical products in general. In particular, the export grew much stronger (33% per year) than the import of specialty chemicals (14% per year), resulting that

specialty chemicals contributed only 34% to the deficit increase during 2000 and 2002. This has contributed to the stabilisation of the deficit in 2003. However, since as discussed, the turnover was not showing healthy dynamics; the competitiveness of the specialty chemical sector in Estonia is ambiguous.

A look at the partner countries in foreign trade helps to resolve this ambiguity. In 2003, 45% of all chemical products and more than 70% of specialty chemicals were exported to the former Soviet Union. The second most important export region was EU15 with 31% of all chemicals and 14% of specialty chemicals. Other countries are on the third position with %ages of 22 and 10, respectively, while exports to CEFTA countries (Czech Republic, Hungary, Slovakia, Slovenia, Romania, Bulgaria) play almost no role (< 5%). With regard to imports, the EU15 assumes the most important position: 56% of all chemicals and 75% of specialty chemicals come from this region. 27% of all chemicals are imported from the former Soviet Union and all other shares are in the order of 10% or below (see *Table D.27*). Being itself a member of the former Soviet Union, Estonia has evidently maintained its historical bonds to the successor countries. In particular, it receives from there considerable quantities of mass chemicals and exports lower quality specialty chemicals in return, in this way, maintaining an almost balanced trade relation. By contrast, the trade relation with the EU15 is very unbalanced with imports from that region alone being significantly higher than exports in all regions together.

Table D.27: Exports and imports of chemicals by main territories in 2003

	Chemical products		Specialty chemicals[1]	
	EUR million	%	EUR million	%
Export structure				
EU-15	89.4	30.7	16.2	13.6
CEFTA	5.9	2.0	4.8	4.0
Former SU	131.3	45.1	86.5	72.3
Other	64.6	22.2	12.1	10.1
Import structure				
EU-15	298.0	56.3	145.3	74.7
CEFTA	36.5	6.9	26.6	10.2
Former SU	140.8	26.6	9.6	4.9
Other	53.8	10.2	24.4	12.5

Source: Statistical Office of Estonia (2005) and personal calculations.
[1] CPA 24.3 + 24.5 + 24.6

This difference in foreign trade relations with different regions may also explain why in this specific case, the stronger growth of exports of specialty chemicals does not necessarily indicate a strong competitive position in general. To some extent, the chemical industry and the specialty chemical sector in particular are competitive, but this position mainly relates to the former Soviet Union where many consumers or users consider domestic products as inferior and EU imports as too expensive. With regard to the EU15, however, the competitiveness of the chemical industry is rather low. From this perspective, the trade balance with the EU15 would certainly look even worse, if Estonia was not able to re-export chemical products that were bought for a favourable price from its eastern neighbours.

With regard to the potential impact of REACH, two effects may be foreseen. On the one hand, exports to countries outside the EU-25 (especially Russia and other members of the former Soviet Union), that is more than two thirds of its current export volume, will most likely be negatively affected, because registration costs will decrease the competitiveness of the Estonian chemical industry. With regard to specialty chemicals, this argument will even apply to four fifths of the exports. Evidently, these shares are much higher than those for the Czech Republic (about 20 %) or Poland (between 25 and 35 %). On the other hand, it is expected by several interview partners that REACH will render it more difficult to maintain imports of raw materials from outside the EU, on which Estonia depends even more heavily than the Poland,

not to mention the Czech Republic. It is unclear whether or not these substances would be registered by their importers. In particular, it is believed that for reasons of administration and enforcement, it would be impossible to form registration consortia between manufacturers/importers from inside and outside the EU.

D.6.1.5 Conclusions from statistical data analysis

Of the three countries more thoroughly investigated in this report, the specialty chemical sector of Estonia shows the lowest degree of competitiveness. The prominent position of the specialty chemical sector within the chemical industry, which appears to be due to its competitiveness with the chemical industry of its eastern trade partners rather than with the industry in other EU member states is contrasted by its stagnation and its low and hardly increasing productivity. In this situation, Estonia and its chemical industry are affected by REACH more strongly than the other countries. First, due to the very large share of Estonian exports to non-EU countries, competitive disadvantages arising from those exports (with the need to comply with REACH) are stronger than in Poland or the Czech Republic. Second, the strong reliance of the Estonian chemical industry on raw material imports from outside the EU and the lower degree of vertical integration (due to the size of the country) increases the risk of non-availability of these substances after the implementation of REACH. Summarizing these facts, the only seemingly favourable situation of the specialty chemical sector in Estonia appears even less favourable in the face of REACH. Due to the existing structural burden (as an important supplier of chemicals to the former Soviet Union) and the low technological standards, the short-term (cost-related) effects of REACH will come to bear more immediately and intensely, whereas the innovation-supporting effect of REACH will become effective much later.

D.6.2 Company analysis

Six companies have been interviewed for the Estonian case study. The companies were selected with the help of the Estonian Ministry of Social Affairs and the Estonian Ministry of Economy, which are actually conducting a national REACH impact assessment. In addition, twelve downstream user companies in the manufacturing sectors of textile processing, furniture production, metal processing, plastics processing and fibre production were contacted. None of these companies was willing to participate in an interview. The given reasons were no time, no resources, no awareness about REACH, no benefit for the company, too early to talk about REACH, low costs for chemicals use, and therefore REACH was seen as of little relevance. As a consequence no interviews at the level of downstream users have been performed.

D.6.2.1 Characterisation of interviewed companies

Two substance manufacturers and one importer of chemicals were interviewed, as well as three formulators of preparations. The product portfolio of one manufacturer consists of organic base chemicals and speciality substances (however, with a broad range of applications). The portfolio of the other manufacturer consists of inorganic base chemicals. Both companies have eventually to register marketed by-products. No intermediates are used as raw materials. The importer trades mainly with HPV chemicals. The portfolio of the formulators primarily covers products for consumer and professional use. Among these are cosmetics, household cleaners, paints and varnishes.

In total the interviewed companies gain with 1190 employees a turnover of 106 million EUR. Thus they contribute together close to 50 % to the Estonian chemical industry turnover, which was in 2002 around 215 million EUR. With less than 250 employees four of the companies can be characterised as SME. The six companies have an average number of 200 employees, ranging from around 30 to over 500. All are private Ltd. companies. The substance manufacturers, as well as one formulator are part of holding companies. Four companies are Estonian-owned, in two EU-15 companies hold shares of 90% and 25%, respectively.

D.6.2.2 Economic situation and product portfolio

Most of the interviewed companies glisten with impressive growth rates. In average, turnover rose by 11.6 in 2003. The variation is between 3 and 19%/a. Excluding one company, which supplied no reasonable figure, the gross profit margins stay between 5 and 25 %/a and is in company's average just below 15%.

The companies are strongly export-oriented. Almost 60 % of turnover is sold abroad, 40 % of turnover in non EU countries. This high export rate to non EU is of certain importance, because on these markets the Estonian companies are competing with others having not to bear the impacts of REACH.

Four companies gave information on the cost structure of production. Raw material is by far the most important cost factor. Excluding the importer of chemicals, because its cost structure is not comparable to manufacturers, average of raw material costs account for 42% of production costs. The wages of workers in production are with reported values of 1.9 to 2.3 EUR per hour lower than for the other case studies. With such wages not surprisingly, personal cost contributes with 18% only moderate to total production costs.

The payback time of company's profitability requirements for investments has been reported with 4 and 5 years. One manufacturer uses 10 years, but only for a certain product of his portfolio. Discount rates requirements were only given by two companies, one with 6, the second with 9%/a. The other companies stated that discount rates are not used in investment calculations.

The manufacturers of substances directly import raw materials from non-EU. The formulators do use substances and preparations produced outside the EU but purchase them from a local supplier. A total of 626 raw materials are used by the interviewed companies. Of these 120 have their origin in non-EU Eastern Europe (19%), and 15 in other non-EU countries (2.4%). A total of 148 substances are produced or imported, of which 83 or 56 % are classified as dangerous. Because no substances are produced by the three formulators, they know that direct REACH costs will arise as a consequence of substance registration.

Those chemicals selected for the vulnerability assessments contribute most to the overall turnover of the companies. These were six organic substances and one complex substance in the case of one manufacturer and four inorganic substances and one by-product in the case of another. Of the 11 substances, four are regarded registered under REACH. The NPV assessment show that three substances will have negative NPVs, where, in two cases this is related to the fact that production just recently started and the margin is still negative. The company expects to increase production and that the margin will become positive in the future. For the third substance (by-product) the company expects losses even if the substance would not have to be registered under REACH. The remaining four substances are not regarded vulnerable at all (positive NPVs). The direct one-off cost burden of REACH in relation to one annual turnover is below 2% in one case and about 13% in the other case. For the latter case, this may change in cases of consortium registration and data sharing with other companies.

In contrast to that, the cost burden calculation for the importer came out as very heavy. The expenditures for registration of his entire substance portfolio would take 80% of the turnover of one year. This may be possible to reduce in cases of consortium registration and data sharing with other companies. Of a total of 77 products assessed, 9 are exempted from REACH, 13 are either mixtures and/or no imports from Non-EU countries. Of the remaining 55 substances, 49 are HPV (90%), 2 are LPV (3.6%) and 4 are neither HPV nor LPV (6.4%). Bulk chemicals which are imported in small amounts pose a specific problem for importers in general, as here prices and profit margins are very low and a registration at the level of a single company is commercially not attractive.

A comparison of EU and non-EU markets shows that the purchasing prices of substances on the Russian and Byelorussian market are in the average 35% lower than in the EU. For this, even after investment into registration of imported substances from there and cost pass on over the pay back period, the price for some substances stays below those of EU origin.

D.6.2.3 Accession impact and HSE management

Summed up over all interviewed companies 14 employees of a total of 1190 were involved in the implementation and enforcement of the Acquis communautaire. The implementation of the chemical Acquis is fully completed, with the exception of one company. Main efforts have been the compilation of SDS and the update of classification and labelling. One company stated a high workload for risk assessment on workplaces. But none of the companies have reported of exceeding cost burdens. As advantages are seen gain in company's image and the overall environmental performance. As drawbacks is reported the increase of personnel resources. One company stated that the new legislation causes restrictions to the free market. No influences on the product portfolio did occur, but one company stated that phasing out of certain dangerous products was enhanced.

A total of 457 SDS is managed by 9 persons. This gives an average of 50 responsible persons per SDS. This is rather low compared to the situation in the EU-15 but in a range similar to the Czech Republic.

D.6.2.4 Innovation performance

In the average the interviewed companies spent 2.7 % of turnover on R&D, ranging from 0.2 to 6.4 %. 2.1 % of total staff is involved in R&D, where one formulator is the front-runner with 12.9 %. The innovation performance visible from theses indicators is somewhat better than in the other case studies, but is below the average of the EU-15 countries. In general, it became quite obvious that formulators invest more in R&D than substance manufacturer. The latter invest primarily in process technology.

As prominent R&D task has been reported the development and improvement of new products, improvement of process technologies, and, surprisingly, *down*scale of production facilities, when production volumes during Soviet times was higher than today.

The typical lifetime of the products of the formulators is between 5 and 10 year, which is quite a lot. An explanation may be that they are producing consumer products, which don't reach the innovation rates of products for industrial applications. The formulators stated that phasing out of substances is with 1 to 3 per year rather rare. The given figures for refreshment and reformulation of preparations fits quite well between the companies, but are considerably lower than in the Czech case study. The lower wages in Estonia do not explain the differences however it may relate to the fact that most of the preparations are consumer products and not products for special applications in industrial manufacturing.

Table D.28 Cost and time to market for a reformulation of preparations

	Unit	Span of company's guess
Cost of a refreshment …[a]	kEUR	0.5 – 1.5
… time-to-market	month	0.25 – 2
Cost of a redesign …[b]	kEUR	1 – 2
… time –to-market	month	0.5 – 2
Cost of a new development …	kEUR	7 – 23
… time-to-market	month	2.5 – 24

[a] substitution of a none functional component (modification), needing primarily stability testing

[b] substitution of a functional component (reformulation)

D.6.2.5 Strategies to cope with REACH

All companies have some basic information about the provisions of the REACH proposal, but many details remain unknown. None of the companies have so far made a quantitative assessment of Reach impacts. One formulator as a first step made a screening of his substances uses. A view how to organise cooperation along the supply chain for exposure assessment and risk characterisation is not present. The substance manufacturers are interested to join consortia for registration, one made the reservation not to be forced to disclose process knowledge. A fear is that companies of EU-15 will gain a better position on the domestic market due to REACH. It was also said that improving the information on chemicals and its use as a consequence of REACH will enhance demand and production of green products.

Some of the companies doubt whether it will be possible to pass on cost impacts to customers in full. One company states the hope that registration costs will be recovered by governmental funds. Relocation of production outside EU to avoid REACH burdens is for none of the interviewed companies an option.

Three of the six interviewed companies see the need to improve information exchange about used chemicals along the supply chain, two don't see this need, and one didn't state his position on that.

Overall, the attitude of the companies to REACH is critical, some see the need for improvement of chemicals regulation, but the present proposal seems for the companies to complicated and the foreseen procedures to bureaucratic.

D.6.3 REACH impacts on selected chemicals

The preparations produced by the formulating companies are mainly consumer products. Most of them do not contain specialty substances. Main selection criteria for the assessment were either the contribution of the preparation to the company turnover, or any type of strategic advantages connected to the product, or a substance origin from outside EU.

Due to the late inclusion of Estonia as one of the case studies and the lack of participating downstream users, it was not possible to trace particular substances through the supply chain. The impact analysis on certain chemicals is focused on potential effects as a consequence of phasing out of product components, and on price increases of raw materials for the formulation of products.

For the assessment of raw materials used for the analysis of preparations the following steps were taken:
1) the interviewed companies provided information on the identity and concentration of components of the preparations as well as the prices per raw material in €/kg
2) specific registration costs for each component was assumed
3) the resulting price increase per raw material was added to the cost of the preparation according to the concentration of the substance in the preparation.

ad 2) Derivation of a specific registration cost per component:

a. a likely tonnage band was assumed based on information of ESIS[17]
b. an average registration cost was assigned to the substance assessed according to the likely tonnage band of the producer

ad 3) price increase:

[17] For substances listed in IUCLID with EU production volumes > 100,000 t/a a production volume of 10,000 t/a was used. For EU volumes > 1,000,000 t/a a production volume per manufacturer of 100,000 t/a was assumed. If it was a listed HPV but no volume information was available, 1,000 t/a was used (worst case). If the substance was an LPV, 3, 30 or 300 t/a production per manufacturer were assumed, based on own expertise or discussion with other experts.

1) a price increase was calculated, taking the average profitability criteria of 8% interest rate and 5 years payback time into account.
2) the price increases of all components were summed up to calculate the price of the preparation

In the assessed first three preparations 33 different substances are contained. The identity of four substances could not be determined. Of the remaining 29 substances, 10% are exempted from registration under REACH, 40% are HPVs and 43% are LPVs according to ESIS. Two substances are neither reported as HPV nor as LPV and thus are regarded as substances produced in amounts < 10t/a. Some components are used as biocide active substances and hence will create no further registration costs under REACH.

Chemical 1

Selection criteria were to have an important "representative" of one product group and that quality is regarded unique. The consumer product contains 2 components, both not dangerous, one component is a very common chemical from EU origin.

The absolute price increase of the preparation is 0.003 EUR/kg if registration costs are passed on in the pay back time assumed. This is 0.34 % of the current price. This price could easily be absorbed or forwarded to clients. It is unlikely that one of the components will be deselected from the market. It is unlikely that the preparation will be significantly affected by REACH.

Chemical 2

This preparation represents a larger product series of cosmetics in the low price segment. It is regarded as unique due to one of its functions and was selected because it is an important "representative" of one product group, and because one of its functions is regarded as unique. The product contains of 3 preparations and 11 substances, mostly not dangerous, purchased by chemical traders.

The absolute price increase of the preparation would amount to 0.04 Euro or 1.18% of the current price over the pay back time if registration costs are fully passed on. The influence of the registration costs on the price of the preparation is thus not significant. Phasing-out of components is not obvious. The LPVs contained in the preparation either are marketed at high prices or are believed to be rather common and thus used in various applications. It is not likely that the preparation is significantly affected by REACH.

Chemical 3

This chemical was selected because it contains substances, which are manufactured in non EU countries, but are purchased from local trade. It is a cosmetic products in the higher price segment. The product contains of 13 substances and 3 preparations. 3 of them are exempted from registration. No dangerous components are present. 7 components are produced by US companies.

The total cost increase of the preparation sums up to 13 cent per kg, causing an increase of 0.5 % of the current price of the product. The calculated costs increase can be absorbed by the margin of the preparation, but as well cost-pass on to clients seems not a problem.

There is obviously no phasing-out endangerment as the contained LPV chemicals are sold at rather high prices. It is not likely that the preparation is significantly affected by REACH.

In the assessed following three examples 23 different substances are contained. All components are HPV chemicals, except for two LPV and one substance which is produced in amounts < 10 t/a. The biocide active substances are not covered by REACH; any increases in market prices for those substances result from the implementation of the biocide product directive. The price

effects from biocides are thus not further assessed. Some input materials originate in the USA and other non EU countries but are purchased at an importing company. All biocide active substances have been notified for inclusion.

Chemical 4

The consumer product was selected because of its high turnover. It contains 5 components, of which 4 are dangerous according to Annex I of directive 67/548/EEC, one of the components is a biocide.
The calculated total price increase for the preparation is 0.0006 Euro/kg. This is a rise of 0.03% of current price. The cost impacts due to the registration under the biocides directive was not considered in this calculation. All components are HPV. A phase-out of components from the market is unlikely. It is not likely that the preparation is significantly affected by REACH.

Chemical 5

This chemical was selected because the product is part of the competitive advantage of the company, as it is a unique high quality product. It originates from an own synthesis, is a polymer solution and used in industrial applications. It contains 8 chemicals, of which 4 are classified as dangerous. 1 substance is exempted from registration. All components are HPV chemicals, except the last mentioned.

The total price increase for the preparation is calculated with 0.005 Euro per kg, which is 0.053% of current price. The costs can most likely either be absorbed by the margin or passed on to the clients. A phase-out from the market is rather unlikely. It is not likely that the preparation is significantly affected by REACH.

Chemical 6

This consumer product is of the strategic importance for the company and is part of its core business. It contains 13 components, except one are all HPV chemicals. Two components are biocide active substances.

The absolute price increase for the preparation is 0.0015 Euro/kg, which is equal to 0.056% of the current price. Only for one component in the preparation a relevant increase in substance price is likely. It remains unclear whether this is a LPV or HPV chemical. The substance is produced in one non EU countries too, thus there is a possibility of it not being registered at all and thus phased out from the market. It is likely that substitutes are available. Nevertheless, a refreshment or reformulation of the product may become necessary.

As result one can say that for the majority of product's components neither a price increase nor disappearance from the market is likely. One component is potentially vulnerable under REACH. The preparation as such seems not endangered.

Almost all components of the preparations of the following three samples are HPV chemicals, polymers, or biocides. LPV chemicals were identified only as components in preparations used as raw material. A few substances were either not specified or could not be clearly identified. Most components are supplied by a high number of producers and importers. Thus, neither significant price effects nor phasing out are regarded as likely.

Chemical 7

The consumer product is a cash cow for turnover, but contains environmentally dangerous substances[18]. It contains of a total of 13 components: 4 no specifiable additives, 1 biocide, 2

[18] This was stated by the company itself. The respective substances is regulated under different EU-legislation as dangerous substance.

polymers, 1 preparation made up of HPV substances, 4 HPV substances and 1 further not unidentifiable substance.

The absolute price increase for the preparation is 0.00024 EUR/kg. As the sales prices were not given, information on the relative price is not available. An endangerment through phasing out is unlikely. Over all it is not likely that the preparation is significantly affected by REACH.

Chemical 8

Again this is a product serving as cash cow for turnover. But in addition the preparation contains a functional additive which is supplied only by few producers. Of the total of 9 components 1 is a preparation, 1 a biocide, 6 are HPV chemicals, and 1 component is not identifiable.

The absolute price increase for the preparation amounts to 0.0003 EUR/kg. A phasing out of substances is very unlikely and it can be excluded that the preparation will be significantly affected by REACH.

Chemical 9

This product is a so called star of the product portfolio, because of its strategic importance. It contains one substance which is supplied only by one producer, and in addition a dangerous substance produced outside EU. The later is supplied by a local trader. The total of 7 components is made up of 3 preparations and 4 HPV chemicals.

The total price increase for the preparation is 0.042 EUR/kg. Two functional components LPV chemical are presently produced only by few manufacturers. These substances may be endangered by phasing out if their registration comes out as not profitable. It is likely that substitutes are available in the market, but this has not been proved. A refreshment or reformulation of the product may become necessary, resulting in additional costs for the formulator. The entire preparation is not seen as endangered. Over all it is not likely that the preparation is significantly affected by REACH.

D.6.4 Conclusions from country case Estonia

Few substance manufacturers exist in Estonia. According to the Estonian industry association, those companies which are listed in statistics as producing specialty chemicals are actually formulators. Substance producers are working either in the field of fertilisers, the refinement of mineral oils, the extraction of ores or the manufacture of other basic chemicals. As there are so few substance producers in Estonia, the case studies can be regarded as representative for this sector.

Both substance manufacturers are part of a holding and contribute to the infrastructure in the regions where they are located. They produce organic and inorganic substances which are base chemicals or specialties. All products of one manufacturer are dangerous, but none of the other is classified. The interviewed importer can be regarded as typical importing and trading company. The main purchase markets are in the former Soviet Countries, the sales markets are mainly in Estonia and EU neighbours. More than 50% of the imported substances are classified as dangerous. The three formulators included in the study produce mainly products for consumers and professionals. Only a very small share of the preparations is classified dangerous according to the European Dangerous Preparations Directive.

According to the association of the chemical industry of Estonia the majority of formulators produce chemicals for consumer use, such as paints and varnishes, cleaners and toiletries. Specialty preparations for industrial use are to their knowledge rather seldom. Companies manufacturing products for industrial use are not represented in the Estonian case study.

In Estonia, base chemicals are normally purchased from local suppliers who usually import from Eastern markets. But specific preparations are purchased rather from European producers, either via a local supplier or directly. In a survey on the occurrence of hazardous substances on the Baltic markets, including Lithuania, Estonia and Latvia, it was found that in the metal processing industry all paints and varnishes, as well as lubricants used by the two assessed Estonian companies are produced by companies of the EU-15. All dyes and finishing chemicals used by the interviewed Estonian textile processing companies are purchased from producers located in the EU-15. The same holds for paints and varnishes applied in the interviewed enterprises active in the wood and furniture production. The results of this survey confirm the impression that only few Estonian formulators produce for industrial uses, and shows that the Estonian downstream users of chemicals in the manufacturing industries depend on formulators in the EU-15.

The results of the interviews show that significant impacts on the competitiveness of the manufacturing companies due to REACH are not likely. The total registration costs will be limited because

- imported input materials for production are either not affected by REACH or are bulk chemicals,
- it is not expected that any of the input materials will be deselected, because a high number of suppliers is present,
- the own product portfolios are not so manifold, and either substances are regarded registered under REACH, or are produced in very high tonnages, or have high prices and sufficient margins to absorb registration costs.

It is expected that the manufacturers will be able to maintain their fairly good positions on the market. As innovation does not play such an important role with regard to the development and improvement of new products, no significant effects are expected.

The substance manufacturers have well developed management systems and data keeping structures and did not report any serious problems in the implementation of the acquis. They are equipped with sufficient personnel to manage challenges. To gain expertise on the assessment of exposures in the frame of a chemical safety report will be in our view one of the main challenges for these enterprises.

For the chemicals importer significant impacts of REACH are likely. As the substances are mainly HPV chemicals, there is a high probability for consortia formation, but the chances for smaller importers to profit from these depends on the implementation of the provisions for data sharing under REACH. Even if data will be shared, it can be assumed that in the average up to 20% of the registration costs for non-dangerous substances > 1000 t/a, and up to 8% for dangerous substances > 1000 t/a, have to be born by the importer himself (administrative costs for preparing the registration and communicating in a consortium; costs to liaise with customers in order to assess the exposure). As the importer does not maintain an own production site, the HSE capacity is lower than in producing companies. The SDS compilation is done by literature research. A management system and a chemicals data base are not maintained. This will increase the difficulties in preparing for REACH and carrying out own registrations.

Currently the competitive advantage results from the import of cheap raw materials from Eastern non EU markets, which are sold with reasonable margins on the Estonian market. The prices of the assessed substances originating from Eastern markets are in the average 35 % below that of EU origin. This means, even when pass on registration costs to substance prices, some substances from non EU Eastern markets may remain still competitive. Depending on the access to data sharing, the importer may on the other hand switch part of his sourcing for bulk chemicals to EU manufacturers. For these substances industrial customers may be confronted with a price increase of 40% to 70% if supply from Russian sources is cut due to REACH registration requirements. This may have a significant impact on the production costs of these

companies. The likelihood of such impacts will partly be driven by the design of data sharing mechanisms under REACH. In this respect, it will be of utmost importance that REACH promotes data sharing among registrants marketing comparable qualities of substances (e.g. with respect to dangerous impurities) and prevents “free rides” of companies importing substances with a high degree of impurities.

The interviewed formulators can be regarded as typical formulators of consumer products. Their direct clients are wholesale and retailers, indirectly private consumers. The majority of products are not classified dangerous. From the interview results it cannot be deduced that significant impacts on the companies' competitiveness are likely. Neither are any relevant increases in raw material costs obvious. Therefore it is not likely that the product portfolio will change due to price increases under REACH.

The influence of REACH on the innovation and time-to-market is also not regarded as high for the consumer products market. The likelihood that components of the formulators' preparations are deselected seems rather low. In the assessed nine preparations, only one substance among 83 raw materials is suspected to be vulnerable under REACH since it is imported from a non-EU country and REACH registration might force the substance to phase out. But even in this case substitutes are available.

The formulator companies have in-house capacity and management instruments to support their work on chemicals, useful under REACH. With view to the input materials, it seems likely that the substance suppliers will include the formulators' uses in their chemical safety assessments. It can be assumed that the formulators will not have to do an own safety assessment due to a use that has not been identified by the substance producers.

Overall, the problems and challenges of the interviewed companies do not appear to be significantly different from the situation in EU-15. Neither the degree of information gathering on REACH, nor the lack of expertise on its provision is specific for the Estonian companies. What remains different is the higher dependency on raw materials import from Eastern non EU countries.

E. BIBLIOGRAPHY

1. European Business – Facts and Figures, EUROSTAT, 2004 edition
2. Progress towards meeting economic criteria for accession: the assessment from the 2003 comprehensive monitoring reports and regular report, DG ECFIN, 2003
3. EUROSTAT Statistics, January, 2005
4. http://www.cefic.be/, CEFIC, 2004.
5. The Economic situation in Poland, http://www.pipc.org.pl/ang1.htm, PIPC, 2004
6. The chemical industry in the EU, Statistics in focus – Industry, trade and service, EUROSTAT, 2004
7. Directorate-General for Information, Task Force Enlargement, Briefing Paper No22: Statistical Annex, 2004
8. Interview, information exchange, and personal communication with industrial associations in Hungary, the Czech Republic, Slovenia, Slovakia, Estonia, and Poland.
9. Frank Ackerman and Rachel Massey: The True Costs of REACH. Global Development and Environment Institute, Tufts University A study performed for the Nordic Council of Ministers TemaNord 2004.
10. Jiří Burel Ing., Ing. Alena Krejčová The REACH system impacts on the industry of the Czech Republik. Ministry of Industry and Trade, 21.05.2004. http://www.mpo.cz/scripts/modules/dmsdoc/document.php?lid=3&id=10625.
11. Joan Canton and Ch. Allen. A Microeconomic Model to Assess the Economic Impacts of the EU's New Chemicals Policy. DG Enterprise. November 2003
12. Consumers' risks from hazardous substances - public information and awareness raising. Overview of the Baltic and other EU non-governmental organisations: their roles and activities to inform consumers on chemicals-related issues Baltic Environmental Forum November 2004
13. Proposal for a REGULATION OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL concerning the Registration, Evaluation, Authorisation and Restriction of Chemicals (REACH), establishing a European Chemicals Agency and amending Directive 1999/45/EC and Regulation (EC) {on Persistent Organic Pollutants} Proposal for a DIRECTIVE OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL amending Council Directive 67/548/EEC in order to adapt it to Regulation (EC) of the European Parliament and of the Council concerning the registration, evaluation, authorisation and restriction of chemicals (presented by the Commission) {SEC(2003 1171} COMMISSION OF THE EUROPEAN COMMUNITIES Brussels, 29.10.2003 COM(2003) 644 final 2003/0256(COD), 2003/0257(COD)
14. EXTENDED IMPACT ASSESSMENT. Commission staff working paper. Commission of the European Communities Brussels, 29/10/2003 Sec (2003) 1171/3 Regulation of the European Parliament and of the Council Concerning the registration, evaluation, authorisation and restrictions of chemicals (reach), establishing a European Chemicals Agency and amending Directive 1999/45/ec and Regulation (EC) {on persistent organic pollutants} " {com(2003)644 final}
15. Krześlak A., Palczewska – Tulińska M.: The effects of Implementation of REACH for Polish Chemical Industry Firms. Chemik 6-7/2004 pages 211-218
16. Lubiewa-Wieleżyński W., Krześlak A.: REACH System- Activities in Europe and Schedule for Necessary Activities In Poland. Chemik 6-7/2004 pages 205-210
17. Opinion on staff requirements in case of REACH implementation. Inspectorate for Chemical substances and Preparations, Institute of Occupational Medicine, Łódź, October, 2003.
18. Report - Round table of Baltic State authorities on REACH Baltic Environmental Forum
    3 June, 2004, Jurmala, Latvia
19. Final report - How it came to REACH and what stands behind. Baltic Environmental Forum. 20 - 21 January 2004, Jūrmala
20. Image of the Chemical Industry 2004. CEFIC Pan European Survey PES 2004.
21. Malta Business Bureau European Monthly Newsletter. May 2004

22. EU2004REACH - The impact of REACH. Overview of 36 studies on the impact of the new EU chemicals policy (REACH) on society and business. ECORYS, OpdenKamp Adviesgroep. Workshop REACH Impact Assessment, 25th - 27th October 2004, the Hague, the Netherlands.
23. The Impact of the New Chemicals Policy on Health and the Environment Final Report Prepared for the European Commission Environment Directorate-General. RPA and BRE Environment. June, 2003.
24. REACH: Impact on Innovation. European Commission Directorate General Joint Research Centre. Brussels, 21 November 2003
25. Assessment of the Impact of the New Chemicals Policy on Occupational Health. Final Report prepared for European Commission Environment Directorate-General. RPA, March 2003
26. Revised business impact assessment for the consultation document. Working Paper 4 Assessment of the Business Impacts of New Regulations in the Chemicals Sector Phase 2. Prepared for European Commission Enterprise Directorate-General RPA October 2003
27. Feasibility study on the resource requirements for a Central Entity. FINAL REPORT. Deloitte & Touche, June 2002 Ref. B4-3040/2001/329289/MAR/C3
28. Hubert Mandery: Challenges for a balanced chemicals policy. ChemCon 2004 6th May Session 11
29. Finn Pedersen, Jack de Bruijn: Assessment of additional testing needs under REACH. Effects of (Q)SARS, risk based testing and voluntary industry initiatives. Sharon Munn & Kees van Leeuwen September 2003. European Commission Directorate General Joint Research Centre. Institute for Health and Consumer Protection.
30. Study of the impact of the future chemicals policy 4 examples of the impacts of the regulation proposal on downstream industries. Mercer Management Company. April 2004
31. Katrin Ostertag Frank Marscheider-Weidemann Gerhard Angerer Andreas Ahrens Ute Meyer. Analysis of the costs and benefits of the New EU chemicals Policy. An examination based on selected sectors taking into account effects on competitiveness, innovation, environment, and health. Fraunhofer-Institute for Systems and Innovation Research ISI. Oekopol GmbH, Institute for Environmental Strategies. Hamburg, October 2004.
32. Petr Sauer, Antonín Dvorák, Petr Fiala, *Negotiation between Authority and Polluters - Model for Support of Decision Making in Environmental Policy: Principles and Experimental Case Test*. Paper presented at World Congress of Environmental and Resource Economists, Venice, Italy, Isola di San Giorgio, June 25-27, 1998).
33. Strategic Partnership on REACH Testing (SPORT). CEFIC, July 2004 www.cefic.be/files/Publications/SPORT_040702.doc
34. CEFIC (European Chemical Industry Council) (2004): *Chemical Industry* 2015. *Roads to the Future.* Brussels 2004,
35. CEFIC (European Chemical Industry Council) (2005): **Economic Time Series**, http://www.cefic.org/factsandfigures/level02/append_index.html
36. CMIT (Czech Ministry of Industry and Trade) (2003): *Panorama of the Czech Industry* 2002, Prague 2003, download: http://www.mpo.cz/xqw/webdav/-UTF8-/dms_mpo/getFileinternet/11528/8878/PANANGL.PDF
37. CMIT (Czech Ministry of Industry and Trade) (2004): *Panorama of the Czech Industry* 2003, Prague 2004, download: http://www.mpo.cz/xqw/webdav/-UTF8-/dms_mpo/getFileinternet/18767/19274/panorama_en.zip
38. DG Entreprise (2000): *Competitiveness of the Chemical Industry Sector in the CEE Candidate Countries*, report prepared for the European Commission, DG Entreprise, under contract PRS/98/501703, Part B, October 2000
39. EKTL (Estonian Association of Chemical Industry) (2005): 'Characterisation of the chemical industry in Estonia', interview with EKTL members, 17th March, 2005
40. EUROSTAT (Statistical Office of the European Community) (2005): 'Industrie, Handel und Dienstleistungen', http://europa.eu.int/comm/eurostat/

41. Fraunhofer (Fraunhofer Institute or Systems and Innovation Research and Oekopol GmbH) (2004): Analysis of the costs and benefits of the new EU chemicals policy. An examination based on selected sectors taking into account effects on competitiveness, innovation, environment and health. Federal Environmental Agency. Berlin, October 2004
42. GZS (Chamber of Commerce and Industry of Slovenia. Chemical Industries Association) (2004): personal communication, Ljubljana 2004
43. PIPC (Polish Chamber of Chemical Industry) (2003): 'Production sold of chemical industry according to branches in 2002', memo
44. PIPC (Polish Chamber of Chemical Industry) (2004a): *Chemical industry in Poland. Annual Report 2003*, downloads: http://www.pipc.org.pl/raport_2004%20cz-1.pdf and http://www.pipc.org.pl/rap.pdf
45. PIPC (Polish Chamber of Chemical Industry) (2004b): 'Characterisation of the chemical industry in Poland', interview with PIPC members, 16th September, 2004
46. RPA (Risk & Polica Analysts Limited) (2004): REACH – One substance, one registration. Final report. Loddon, December 2004
47. SCHP (Association of chemical industry of the Czech Republic) (2003): *Annual Report 2003 on the development of chemical industry in Czech Republic*, Prague, download: http://www.schp.cz/schp/zpravy/Annual_Report_2003.zip
48. SCHP (Association of chemical industry of the Czech Republic) (2004): personal communication, Prague 2004
49. Statistical Office of Estonia (2005): General export and import by commodity groups, http://pub.stat.ee/px-web.2001/I_Databas/Economy/Economy.asp
50. ACICR (Association of the Chemical Industry of the Czech Republic) (1998): Impacts of the Commission's White Paper on the Chemical Industry in CEE Countries. Country Report: The Czech Republic. Brussels :CEFIC-PHARE.
51. Andonova, Liliana (2004): Transnational Politics of the Environment. The European Union and Environmental Policy in Central and Eastern Europe. Cambridge: MIT Press.
52. Andrijewski, Michal (2001): Current State in Transposing EU Chemical Legislation in Poland. Presentation at the Workshop on Application of EU Chemicals Legislation in the Candidate Countries: Progressing towards EU Enlargement, 26.-27. April 2001, Istanbul.
53. Bláha, Karel (2001): Chemicals Legislation in the Czech Republic: Two Years of Implementation. Presentation at the Workshop on Application of EU Chemicals Legislation in the Candidate Countries: Progressing towards EU Enlargement, 26.-27. April 2001, Istanbul.
54. Bonis, Miklos (2003): The Expected Effects of the EU Accession on the Chemical Industry in Hungary. Budapest: International Center for Economic Growth – European Center.
55. Bucknall, Julia; Rita Cestti; Gordon Hughes (2000): The Czech Republic - Complying with the European Environmental Directives. World Bank: Washington D.C.
56. CEC (Commission of the European Communities) (1997): Guide to the Approximation of European Union Environmental Legislation. Revised and Updated Version of SEC (97) 1608.
57. CEC (1998): Communication from the Commission to the Council, the European Parliament, the Economic and Social committee, the Committee of the Regions and the Candidate Countries in Central and Eastern Europe on Accession Strategies for Environment: Meeting the Challenge of Enlargement with the Candidate Countries in Central and Eastern Europe, COM (98) 294.
58. CEC (2001): Communication from the Commission: The Challenge of Environmental Financing in the Candidate Countries, COM (2001) 304 final.
59. CEC (2002): Environmental Protection Expenditure in Accession Countries. Luxembourg: Office for Official Publications of the European Communities.

60. CEC (2003): Conclusions of the Informal Ministerial Meeting between Ms Wallström and the Ministers of the Environment of the Candidate Countries, 21 January 2003, Brussels.
61. CEFIC (1998): Impacts of the Commission's White Paper on the Chemical Industry in the CEE Countries - Final Reports. Brussels: CEFIC.
62. DANCEE (2002): The Environmental Challenge of EU Enlargement in Central and Eastern Europe, Copenhagen.
63. ECLIPS (2004): European Classification and Labelling Inspections of Preparations, including Safety Data Sheets, Final report, June 2004
64. EDC and EPE (1997): Compliance Costing for Approximation of EU Environmental Legislation in CEEC.
65. Fundowicz, Jacek (2003): The Expected Effects of the EU Accession on the Chemical Industry in Poland. Budapest: International Center for Economic Growth – European Center.
66. Government of Czech Republic (2002): Country Profile Czech Republic. Prepared for the World Summit on Sustainable Development (WSSD). Country Profiles Series: United Nations.
67. Government of Hungary (2002): Country Profile Hungary. Prepared for the World Summit on Sustainable Development (WSSD). Country Profiles Series: United Nations.
68. Government of Slovenia (1997): National Action Programme for Integrated Chemicals Management in Slovenia.
69. Grabner, Alojz (2001): Slovene Chemicals Legislation. Presentation at the Workshop on Application of EU Chemicals Legislation in the Candidate Countries: Progressing towards EU Enlargement, 26.-27. April 2001, Istanbul.
70. Joint Commission/CEFIC Working Group on Enlargement (2000): Transposition and Implementation of Chemicals Acquis by the Candidate Countries of Central and Eastern Europe – Recommendations for Development, Brussels.
71. Lang, Krystyna (2002): Summary of the Transposed Chemicals Acquis in the Candidate Countries in Central and Eastern Europe. Presentation at the Conference "Making the Enlarged Internal Market for Chemicals a Reality", November 2002.
72. Olysarova, Magda and Tomas Sedlacek (2003): The Expected Effects of the EU Accession on the Chemical Industry in the Czech Republic. Budapest: International Center for Economic Growth – European Center.
73. REC (Regional Environmental Centre) (1996): Approximation of European Union Environmental Legislation. Case studies of Bulgaria, the Czech Republic, Estonia, Hungary, Latvia, Lithuania, Poland, Romania, the Slovak Republic and Slovenia. Budapest: REC.
74. Soil and Water Ltd. (1999): Development of Action Programme for Implementation of EU Legislation on Chemicals in Lithuania. Final Report DISAE Project LIT-109.
75. Stocker, E. and Anwander, E. (2004): Assessment of Institutional Capacities. Implementation of European Legislation in the Area of Chemical Substances in the Czech Republic. Final Report Twinning Project CZ/2002/IB/EN/01, Prague.
76. UBA (2004): Analysis of the Costs and Benefits of the New EU Chemicals Policy. An Examination Based on Selected Sectors Taking into Account Effects on Competitiveness, Innovation, Environment, and Health. Berlin: UBA.
77. Witzani, Helmut and Michal Andrijewski (2004): Strengthening of the Administrative Capacity for Risk Assessment and Chemicals Control. 3rd Quarterly Report Twinning Project PL/IB/2002/OT/04.
78. World Bank (1999): Bulgaria – The Challenges of Complying with EU Environmental Directives. ESSD Discussion Paper: Washington D.C.
79. World Bank (1999a): Slovenia - Economic Transformation and EU Accession. Volume II: Main Report. Washington D.C.

Institutions providing helpful background information for this report

- Bureau for Chemical Substances and Preparations, Poland
- CEFIC
- Environmental Protection Agency, Sweden
- Federal Environmental Agency, Austria
- Institute for Economic Research, Slovenia
- Malta Standards Authority
- Ministry of Environment, Czech Republic
- National Chemicals Bureau, Slovenia
- TME, Netherlands
- World Bank