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HEALTH, SAFETY AND ENVIRONMENT - RESPONSIBLE CARE PROGRAMM IN ESTONIA

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RESPONSIBLE CARE

Responsible Care is the global chemical industry's own unique initiative which helps the worldwide chemical industry to drive continual improvement in all aspects of health, safety and environmental performance and to be open in communication about its activities and achievements.

Responsible Care is both an ethic and a commitment intended to build trust and confidence in an industry that is essential to improving living standards, the quality of life and sustainable development.

A set of Global Responsible Care Core Principles commit companies and national associations to work together. Through the sharing of information and a rigorous system of checklists, performance indicators and verification procedures, Responsible Care enables the industry to demonstrate how it has improved over the years and to develop policies for further improvement.

In these ways, Responsible Care helps the industry to gain the trust of the public and to operate safely, profitably and with due care for future generations.

Jose Marie Bach

FOREWORD

In my master's thesis I concentrated on the evaluation, how to help chemical industries to understand and raise responsibility and care in their daily jobs.

The main aim is to give advice for the following approaches:

- Why we must implement Responsible Care program?
- What does mean Responsible Care?
- How we have to implement Responsible Care program?

By Responsible Care program member companies are taken a responsibility to increase cleaner production, exchange of information and other activities. Responsible Care helps the industry to operate safely, profitably and with care for future generations.

The first part is introduction to Responsible Care program. It gives an overview of importance and implementation of Responsible Care program. In addition, there are brought out 10 principles followed by companies who have joined the Responsible Care initiative, which enables the industry to demonstrate how its health, safety and environmental performance has improved over the years, and to develop policies for further improvement.

The second part gives a deep overview of Management Framework Requirements, which are based on the cycle of Plan – Do – Check – Act.

The third part introduces The Responsible Care Global Charter, which is a new guide for The Estonian Association of Chemical Industry – how to move on with Responsible Care program.

In the fourth part, there is a table of the Responsible Care committee with responsible persons.

In the fifth part there are indicators, reported about the year 2002-2004 from the member companies. The exact definitions of each indicator are given and comparative diagrams are made about the year 2002-2004. There are also analyses of reported indicators.

The sixth part gives an overview about the future visions and there is also an Annual Plan.

Conclusion gives an evaluation of profitableness of Responsible Care program.

The Estonian Association of Chemical Industry provided a great help in collecting neccesary datas.

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1 INTRODUCTION

1.1 Global Responsible Care Approach

A set of Fundamental Features and Guiding Principles are the basis of all national Responsible Care programs.

Global Fundamental Features:

- Establishing and implementing a set of Guiding Principles that member companies can sign
- Adopting a title and logo that are consistent with Responsible Care
- Implementing management practices through a series of systems, codes, policies or guidance documents to assist companies to achieve better performance
- Developing a set of performance indicators against which improvements can be measured
- Communicate with interested parties inside and outside the membership
- Share best practices through information networks
- Encouraging all association member companies to commit to and participate in Responsible Care
- Introduce and apply systematic procedures to verify the implementation of the measurable elements of Responsible Care by member companies.

Global Core Guiding Principles:

The Global Responsible Care Core Principles commit companies and national associations to work together to:

- Continuously improve the environmental, health and safety knowledge and performance of our technologies, processes and products over their life cycles so as to avoid harm to people and the environment.
- Use resources efficiently and minimize waste.
- Report openly on performance, achievements and shortcomings.
- Listen, engage and work with people to understand and address their concerns and expectations.

- Cooperate with governments and organizations in the development and implementation of effective regulations and standards, and to meet or go beyond them.
- Provide help and advice to foster the responsible management of chemicals by all those who manage and use them along the product chain.

The fundamental features and Guiding Principles act as the stable set of concepts that, if turned into practice by an organization, open the door to environmental, health, and safety excellence [11].

1.2 The Responsible Care Initiative

The Responsible Care initiative is managed and organised by chemical industry and the core of the initiative is aimed at increasing responsible production, exchange of information and other activities. It is a voluntary initiative of producers, importers and sellers of chemical products to do something in addition to what is legally required. The Federation of the Estonian Chemical Industry helps to compare various indicators of the companies who have joined the initiative [8].

The members of the Federation of the Estonian Chemical Industry intend to behave in accordance with good practices also when the company is not directly obliged to do so. For the company it is a way of expressing care for the impact of its products and activities also after the product has left the company [12].

The principles followed by companies who have joined the Responsible Care initiative.

1. We make human health and safety, environmental protection, limiting of waste and contamination critical considerations and an inseparable part of the company's business process;
2. We train, guide and encourage all the employees of the company to act responsibly in the field of environmental protection and occupational health and safety;

3. We work on an ongoing basis to foster the sustainable use of energy and reduction of waste, contamination and pollutants;
4. We assess, acknowledge and reduce the environmental and occupational health and safety risks in our activities;
5. Within the limits of available possibilities we first investigate the influence of new processes or products on the environment and occupational health and safety before implementing them;
6. We inform public agencies of our activities and of their possible influence on the environment and occupational health and safety;
7. We inform the local public and other interest groups of our production activities and products and their possible influence on the environment, human health and safety, and we are prepared to answer the public's questions;
8. We advise our clients on the safe management of our products and removal of waste;
9. We expect our partners to follow the same principles and we encourage and help them;
10. In the case of a transfer of technology we explain to the recipient the terms of use, which are necessary to protect the environment and human health and ensure safety [13].

1.3 Scope of the Responsible Care framework

Responsible Care program is based on a management process, and as such, does not state specific performance criteria.
The program will increase harmonisation and consistency, raise performance and is modelled on structures commonly reflected in informal and formal management systems such as:

- ISO14001:2004, Environmental Management Systems
- BS8800:2004, Guide to Occupational Health and Safety Management Systems
- OHSAS18001:1999, Occupational Health and Safety Management Systems – Specification

- ILO-OSH 2001, Guidelines on Occupational Safety and Health management systems.
- SIGMA Project – Sustainability - Integrated Guidelines for Management and the management system requirements of:
    - Eco-Management and Audit scheme (EMAS) Regulation (EC) No 761/2001 (OJ L 114 of 24.4.2001), which are used throughout the industry.

Many companies already have one or more of these and may make use of them to deliver aspects within the framework.

All reported indicators must respond to exact value. For example CO2 emissions can't be higher than in regulative law, it is all the same with other indicators too. When it is higher you have to pay taxes and this program tries to reduce all these indicators or keep them in normal level [1].

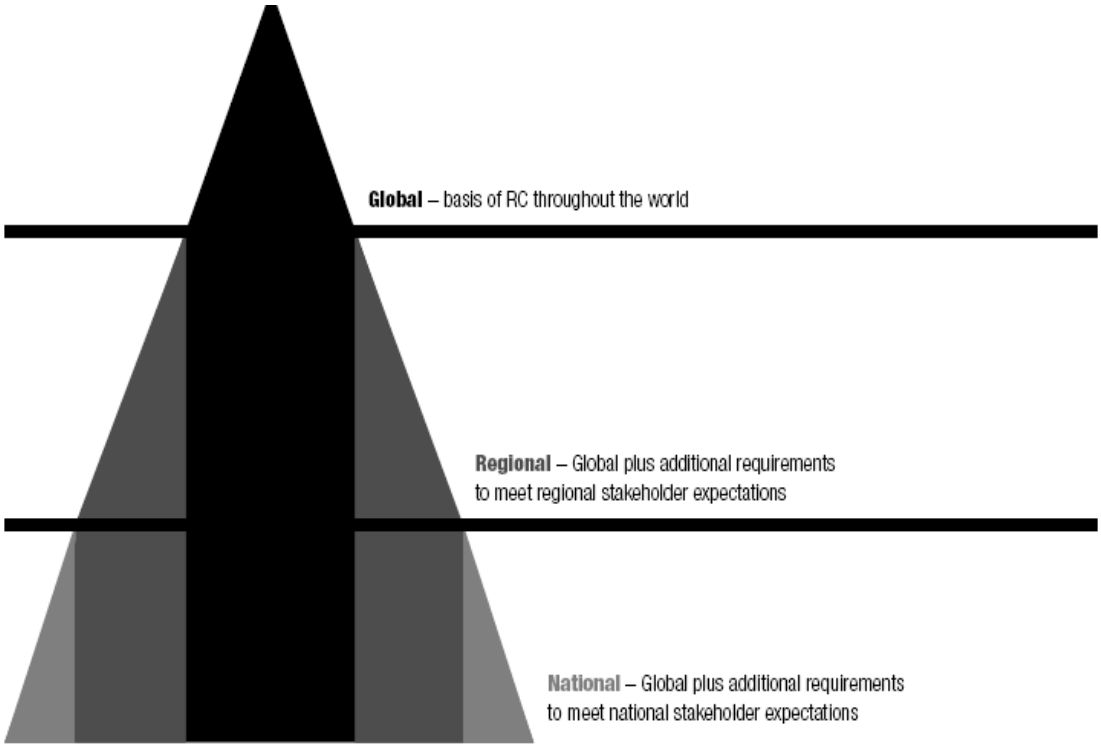

Figure 1.3 Scope of the Framework

1.4 Implementation of the Program

This high level program has been written with the expectation that it will help organisations, of all sizes, advance Responsible Care within their existing management system/processes, or introduce one if they do not have one.

The Program can be used in the context of any management system and is applicable to any organisation in the chemical, or allied, industry which aims to:

- meet statutory requirements and Industry Goals & Targets
- maintain control of activities, people, equipment and materials
- achieve continual improvement
- assemble and retain Responsible Care knowledge and good practice
- provide education and training for its employees and contractors
- provide transparency of information and demonstration of improvement for its stakeholders

The Program supports organisations in defining their own policy, objectives, priorities and performance targets and achieving them.
Implementing a robust management system does take time and effort but significant benefits can be achieved by a consistent approach across Europe [18].

It is also good commercial sense to reduce costs to the organisation in terms of:

- people's time (e.g. lost workdays due to illness or injury, reworking products)
- property (e.g. damage caused by incidents, increased breakdowns due to inadequate maintenance)
- energy and materials (e.g. emissions to air, water; scrap to landfill; spills, rework, inadequate management of utilities)
- future liabilities (e.g. contaminated land, claims for ill-health, product liability)
- increased insurance premiums and/or reduced coverage

These costs can be reduced and experience has shown that the implementation of a Responsible Care management system can help to achieve significant improvements [11].

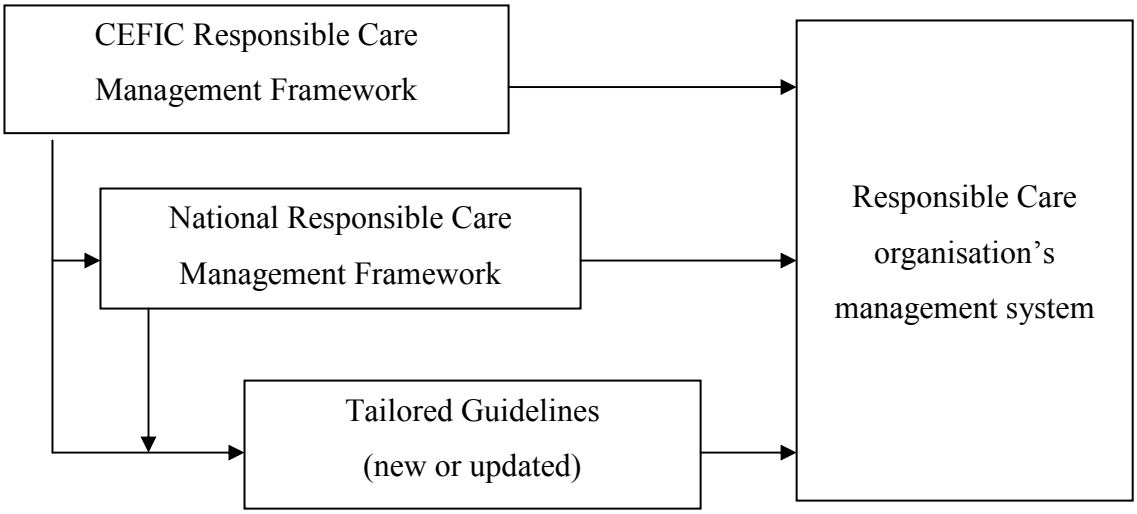

Figure 1.4 Implementation Options for Associations

1.5 Verification of the Responsible Care Implementation

Verification is one of the fundamental features and considered an essential element of the Responsible Care initiative. Self assessment by companies on their implementation of Responsible Care is a mandatory requirement within Europe and seen as the means on delivering on this fundamental feature [10].

All member companies have filled self-assessment questionnaire and in this year this questionnaire will be analysed and summarised, if necessary will be amended.

2 RESPONSIBLE CARE MANAGEMENT FRAMEWORK REQUIREMENTS

This framework (which is based on Deming's Plan-Do-Check-Act cycle) shall be applied to current, and any future, key elements of the Responsible Care initiative, e.g. occupational health, occupational & process safety, environment, product stewardship, emergency preparedness, distribution, stakeholder engagement. A schematic of the key framework phases which Responsible Care organisations shall address through their management system is shown in Figure 1.5 and explained below [11].

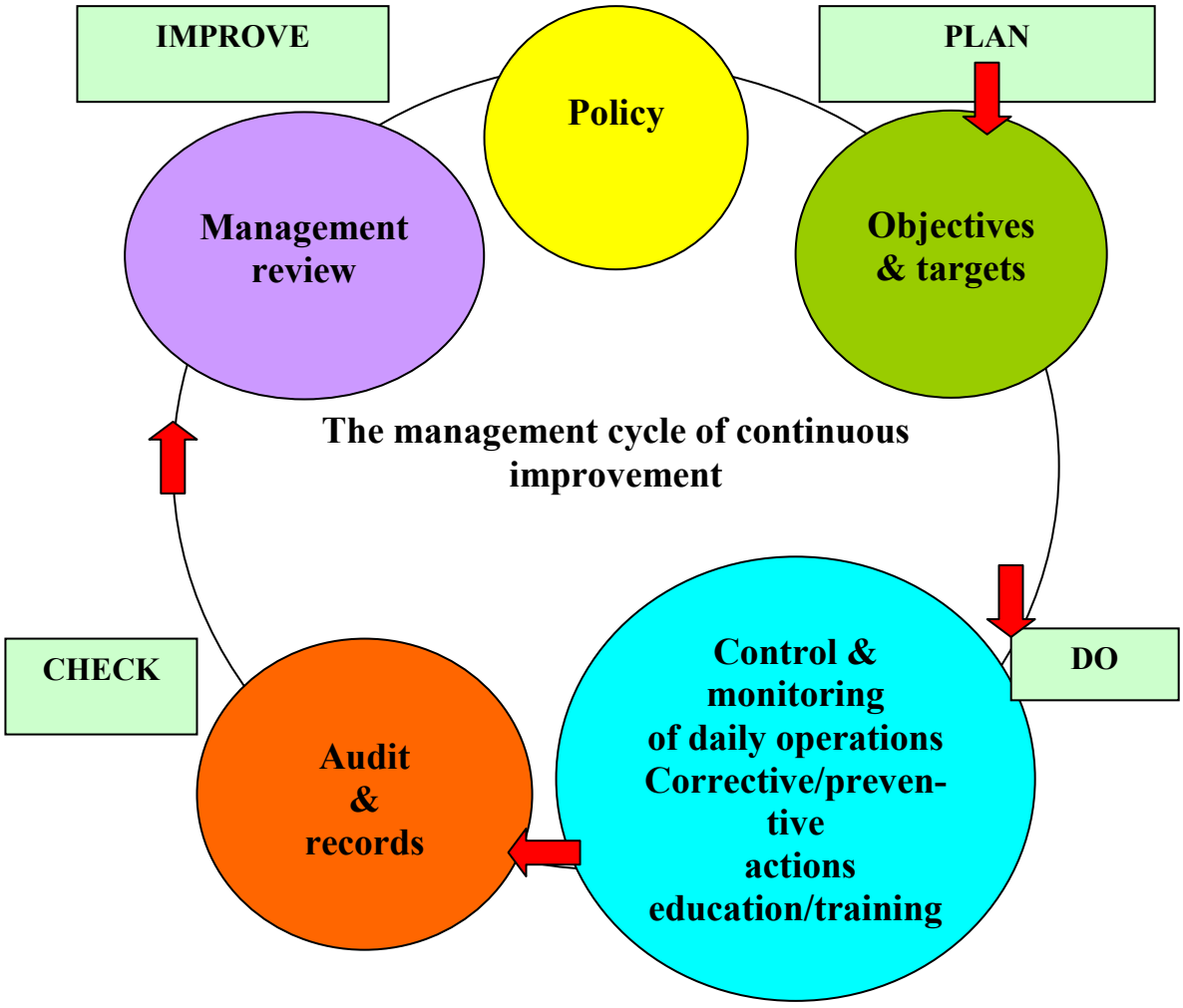

Figure 1.5 Management Framework Phases [9].

2.1 Leadership and Commitment

Clear and effective leadership is essential to ensure that the vision, ethics, values and beliefs of the organization support a positive Responsible Care culture.

Leaders demonstrate their commitment to all employees and stakeholders in a highly visible way, and ensure that changes take into account the organization's Responsible Care commitments.

Managers and leaders at all levels in the organisation ensure that the effectiveness of the management system is maintained and addresses the current and future Responsible Care issues, together with the needs and expectations of the organisation's stakeholders, both internal and external thereby supporting sustainable development [11].

2.2 Policy

Responsible Care organizations have a documented policy, or policies, which address the relevant aspects of their business including Responsible Care.

For some organizations a more specific statement may be required for each location and/or business unit which is consistent with the overall company, and/or corporate, policy.

Top management ensures that the policy is:

- communicated to employees and their representatives and contractors
- publicly available
- appropriate to the nature, scope and scale of activities
- compatible with business goals
- authorized by the top level of management
- readily understandable
- periodically reviewed

When writing the policy the following should be addressed:

- compliance with relevant legislation, regulation, codes, standards and other requirements to which the organization subscribes, for example Responsible Care, EMAS etc;
- commitment to good Responsible Care practice including continuous improvement and recognition of the roles, duties and responsibilities of all employees in achieving this;
- principles for the future developments of products, services and activities;
- providing a framework for setting and reviewing goals, objectives and targets;
- management of risk in order to prevent harm to people and the environment;
- communication with stakeholders, both internal and external [11].

2.3 Identify Requirements

A Responsible Care organisation develops strategies to identify and maintain the requirements that need to be delivered by its management system. The strategy should take into account past, present and future challenges, including Responsible Care, which the organisation faces and the current and potential areas/markets in which they operate [11].

2.4 Plan

To formulate long-term strategies, develop tactical plans that prioritise the significant requirements for improvement and control, and to set goals & targets and to document plans to achieve them [11].

2.5 Organise

To define the structure of the organisation and responsibilities, the type and extent of resources and the documentation required to implement the policy, control and objectives, including documentation of the management system [11].

2.6 Implement and Control

To put into practice the plans to meet the organisation's policy and objectives and improvement plan. To identify the controls that should be in place for the activities those are defined as significant [11].

2.7 Monitor

To generate and maintain efficient internal and external feedback loops to monitor progress against stated values, strategies, performance objectives and targets of the organisation in meeting its Responsible Care requirements, and to correct deficiencies [11].

2.8 Management Review

To meet the information needs of internal and external stakeholders and incorporate feedback into effective strategic and tactical reviews, including the effectiveness and suitability of the management processes and organisational performance in achieving the goals, objectives and targets, culminating in appropriate change [11].

3 THE RESPONSIBLE CARE GLOBAL CHARTER

The Responsible Care Global Charter arose from an examination of our practices and performance and was shaped by considering the recommendations of independent stakeholders from around the world.

It extends and builds upon the original successful elements of Responsible Care and focuses on new and important challenges facing the chemical industry and society. These specifically include sustainable development, the effective management of chemicals along the value chain, greater industry transparency, and greater global harmonization and consistency between the national programmes.

The Charter literally catapults Responsible Care into the 21st Century [15].

3.1 Element of the Global Charter

1. *Adopt Global Responsible Care core principles:*

The Global Responsible Care Core Principles commit companies and EKTL to work together to:

- Continuously improve the environmental, health and safety knowledge and performance of technologies, processes and products over their life cycles so as to avoid harm to people and the environment.
- Use resources efficiently and minimise waste.
- Report openly on performance, achievements and shortcomings.
- Listen, engage and work with people to understand and address their concerns and expectations.
- Cooperate with governments and organisations in the development and implementation of effective regulations and standards, and to meet or go beyond them.
- Provide help and advice to foster the responsible management of chemicals by all those who manage and use them along the product chain [16].

2. Implement fundamental features of National Responsible Care Programmes:

EKTL establishes and manages its own Responsible Care programme based on a set of eight common fundamental features. They are:

- Establish and implement a set of Guiding Principles that member companies sign.
- Adopt a title and logo that are consistent with Responsible Care.
- Implement management practices through a series of systems, codes, policies or guidance documents to assist companies to achieve better performance.
- Develop a set of performance indicators against which improvements can be measured.
- Communicate with interested parties inside and outside the membership.
- Share best practices through information networks.
- Encourage all association member companies to commit to and participate in Responsible Care.
- Introduce and apply systematic procedures to verify the implementation of the measurable elements of Responsible Care by member companies.
- Industry leaders support the national associations in the fulfillment of these fundamental features.

The Charter defines specific commitments consistent with the fundamental features [15].

3. Commit to advancing sustainable development:

Responsible Care is a uniquely designed initiative that enables the chemical industry to make a strong contribution to sustainable development.

Through improved performance, expanded economic opportunities, and the development of innovative technologies and other solutions to societal problems, the industry will continue taking practical steps to implement initiatives in support of sustainable development.

The industry will expand its dialogue with stakeholders to identify additional opportunities to contribute to sustainable development through Responsible Care.

The chemical industry recognizes the important contribution that can be made through the sound management of chemicals to achieve sustainable development goals. The industry will continue to support national and international initiatives to advance these goals.

4. Continuously improve and report performance:

Each chemical company that implements Responsible Care is expected to collect and report data for a core set of environmental, health, and safety performance measures. EKTL is expected to collect, collate and report this data from its members. The data will also be collated and reported publicly at the international level, and be updated every two years at a minimum.

In order to continue to achieve improved performance, EKTL will:

- Periodically assess, with the participation of their members, stakeholder expectations for expanded or modified performance reporting or other aspects of performance.
- Commit to providing practical help and support in sharing and adopting best practices to improve environmental, health and safety performance, and other assistance related to Responsible Care implementation needs.

Chemical companies that implement Responsible care will:

- Adopt a management systems approach to implement their Responsible Care commitments consisting of the internationally accepted elements of Plan-Do-Check-Act.
- Utilize clean and safe technologies and processes when building new plants or expanding their current facilities around the world.
- Go beyond self-assessment of the implementation of Responsible Care and adopt verification processes carried out either by associations, government bodies or other external organizations.

5. Enhance the management of chemical products worldwide – Product Stewardship:

Product stewardship issues will increasingly shape the Responsible Care initiative in future years. ICCA will establish a strengthened global programme to evaluate and manage chemical-related risks and benefits by developing a unified product stewardship management system approach. This approach will be in place by 2006.

EKTL, working with their member companies, will commit to this concerted global effort by establishing processes for Responsible Care companies to:

- Re-commit to full implementation of current Responsible Care product stewardship commitments, including all existing codes, guidelines and practices.
- Improve product stewardship performance and increase public awareness of the industry's commitments and results.
- Develop and share best practices through mutual assistance.
- Work in partnership with upstream suppliers and downstream chemical users to collaborate on improved processes for the safe and effective uses of chemicals.
- Encourage and sustain support for education, research, and testing approaches that will yield useful information about the risks and benefits of chemicals through such initiatives as the High Production Volume chemical testing programme and the Long-range Research Initiative.
- Implement enhanced product stewardship commitments consistent with the ICCA's Global Chemicals Management Policy, and periodically assess product stewardship practices in the light of evolving societal expectations for chemical products.

6. Champion and facilitate the extension of Responsible Care along the Chemical Industry's value chain:

Responsible Care companies and EKTL commit to promoting the Responsible Care ethic, principles, and practices along their own value chains and communicating the importance of the industry's economic and social contributions.

Chemical companies and EKTL commit to increase dialogue and transparency with their business partners and other stakeholders and to expand knowledge and understanding of the management of chemicals. They will also work in partnership with national governments, multi-lateral and non-governmental organisations to define mutual assistance priorities and share access to information and expertise.

7. Activly support national and local Responsible Care governance processes:

The chemical industry, through the ICCA, commits to an enhanced, transparent and effective global governance process to ensure accountability in the collective implementation of Responsible Care. The governance process will be implemented by the ICCA and will incorporate such issues as tracking and communicating performance commitments; defining and monitoring the implementation of Responsible Care obligations; supporting national association governance; helping companies and associations to achieve Charter commitments; and establishing a global process for revoking, when necessary, the Responsible Care status of any company or association that fails to meet its commitments.

8. Address stakeholder expectations about chemical industy activities and products:

The global chemical industry will extend existing local, national and global dialogue processes to enable the industry to address the concerns and expectations of external stakeholders to aid in the continuing development of Responsible Care.

9. Provide appropriate resources to effectively implement Responsible Care:

Responsible Care is the signature performance initiative of the chemical industry, and will have an increasingly important part to play as a basis for the industry's views in societal and regulatory discussions. Companies participating in Responsible Care must support and meet the requirements of the national programmes and provide sufficient resources for implementation [15].

3.2 The Global Charter Contents Explained

There are nine key elements in The Charter.

The first element describes a new and common set of core principles for all 52 national Responsible Care programs.

These Principles describe that Responsible Care is a partnership between the EKTL and his member companies working together to continuously improve Safety, Health and Environmental performance of their processes and products, making efficient use of resources and minimizing wastes.

Through these principles the EKTL and companies are also expected to ensure that they will:

- report openly on performance;
- have an ongoing communication with people inside and outside the industry;
- co-operate with their governments and other national organizations;
- and foster the responsible management of chemical products by all those who handle and use them along the product chain.

Adoption of these principles will enable us to better communicate what we stand for, both to ourselves and to the public.

The second element describes the 8 fundamental features which serve as a template for the implementation of every program while giving a degree of freedom to enable EKTL to address local issues and cultures. These features remain unchanged.

The third element is new to Responsible Care and addresses Sustainable Development. It calls for the whole of the industry to advance its environmental, social and financial values through improved transparency and performance; the extension and

expansion of the economic opportunities; and to play its part in the development of innovative solutions to societal and product-related issues.

The fourth element addresses the very core of the Responsible Care initiative, that of continuous improvement in performance and reporting. In particular the Charter sets out a number of important developments.

- To undertake a periodical review of the core performance measures against which improvement can be judged.
- To encourage companies to adopt a management system approach based on the elements of Plan-Do-Check-Act upon which to run their operations
- and for companies to utilize clean and safe technologies and processes.

Of particular importance is the move for verification processes to go beyond self assessment.

While the Charter does not require an immediate move towards third party verification, its objective is to strengthen verification processes. This could be through such options as work carried out:

- by associations
- by assessors from other companies,
- through acceptance of verification by government bodies
- or through external organizations such as third party auditors.

We have to go beyond self assessment. Time and again we hear from our stakeholders, our shareholders and our customers that they expect us to do this. It is an expectation that we cannot ignore if we are really serous about Responsible Care.

The next two key parts of the Charter cover product stewardship and extending the Responsible Care ethic along the value chain.

We all realize that we must increase our focus on our products. The Charter contains details on strengthening our approach to chemical products management where decisions are taken on the basis of risk supported by scientific knowledge. Inclusion of product stewardship into the overall management systems approach is also seen as a necessity to ensure improvement and winning public recognition.

Increasingly, many of the challenges we face go beyond our factory gates into our value chain. The goal of the Charter is to extend the ethic, principles and practices of Responsible Care throughout our value chain. This should lead to improved transparency with our customers and facilitate partnerships with governments in providing information that solves rather than poses problems.

The three final elements of the Charter are:

- Governance
- Stakeholder interaction
- Resourcing

Firstly governance processes will be strengthened to enable us to demonstrate to ourselves and to the public that we are doing a better job in a more transparent way. Effective governance is important in the eyes of our stakeholders.

We have to demonstrate clear tracking and communicating of performance. We have to define and monitor the implementation of Responsible Care obligations and find ways to help companies and associations to achieve Charter commitments.

Next, the Charter specifically addresses stakeholder expectations and commits us to extending our existing processes to listen to and understand stakeholder concerns. We will therefore periodically convene stakeholder information sessions as part of a concerted international dialogue program.

And finally, it's important to recognize that improved performance requires us to continually examine the correct level of resources that will be needed to implement new commitments in companies and associations.

Commitment to the Charter will help to ensure that the support is forthcoming.

The launch of the Charter represents a unique moment in time for the owners of Responsible Care to reaffirm their support to this vital initiative.

Responsible Care has brought much advantage both to our own activities and those we undertake with our stakeholders. Through the Charter, Responsible Care will, in the years to come, continue to contribute real value not only to our industry but to society as a whole [3].

4 COMPANIES JOINT WITH RESPONSIBLE CARE

The fields of occupation of EKTL members are production and brokerage of raw materials (incl. shale oils), production and sale of paints, polishes and chemical substances used in construction, production and sale of chemical and cosmetic products, production of different plastic materials and polyethylene pipes, ADR transportation of chemical liquids and scientific research.
At the moment the Responsible Care Program has 10 members: Algol Chemicals OÜ, Bang&Bonsomer Eesti AS, Carboshale AS, Kemivesi AS, Orto AS, Silmet AS, Tikkurila Vivacolor AS, Univa AS, Velsicol Eesti AS and Viru Keemia Grupp AS [21].

Table 4 Responsible Care Committee

No	Name	Company	e-mail
1.	Tarmo Siir	AS Kemivesi	tarmo.siir@kemira.com
2.	Aare Ignat	AS Orto	Aare.Ignat@orto.ee
3.	Leili Küppar	AS Vivacolor	leili.kuppar@vivacolor.ee
4.	Andrei Srednjakov	Velsicol Eesti AS	asrednjakov@velsicol.ee
5.	Raimo Päri	AS Silmet	valgagr@online.ee
	Anti Siinmaa	Ökosil	anti@ecosil.ee
6.	Jaak Jürgenson	Viru Keemia Grupp	jaak.jyrgenson@vkgrupp.ee
7.	Margit Tuul	Univa AS	margit@univa.ee
8.	Meelika Koitjärv	Bang&Bonsomer Eesti AS	meelika.koitjarv@bangbonsomer.ee

No	Name	Company	e-mail
9.	Priit Päeva	Algol Eesti OÜ	priit.paeva@algol.ee
10.	Rael Videvik	Carboshale AS	rael@rnk.ee

5 INDICATORS, REPORTED ABOUT THE YEAR 2002-2004

5.1 List of Core Parameters

Responsible Care is related with many environmental problems, such as SO2, VOCs, NOx emissions into air and also nitrogen and phosphorus emissions. The main aim is to reduce every year each performances or environmental problems [17].

This is forth successive year of reporting. Data are collected against a set of several indicators to help in the management of operations and assist federations and companies to share best practice and benchmark their performance against other countries and companies. Some of the indicators are new and are not available yet.

Safety and occupational health

- Lost time injuries frequency rate (for employees and contractors)

Environmental protection, including Climate Change

- Non-Hazardous waste for disposal
- Volatile organic compounds - NEW
- Carbon dioxide
- Chemical oxygen demand

Use of resources

- Use of energy, specific energy consumption
- Water consumption - NEW

Transport

- Transport incidents - NEW [16]

5.2 Health & Safety at work

The chemical industry is one of the safest manufacturing sectors in Europe and its record continues to improve. Among chemical companies, those adopting Responsible Care have better health, safety and environment performance than those not committed to the initiative [17].

Core parameter 1: lost time injuries frequency rate for employees

- Definition: a lost time injury is an instantaneous bodily defect so that the individual is physically or mentally unable - as determined by a competent medical person - to work on a scheduled day or shift, resulting in at least **one day** off the job.
- The frequency rate is expressed as the **number of lost time injuries per million working hours** [16].

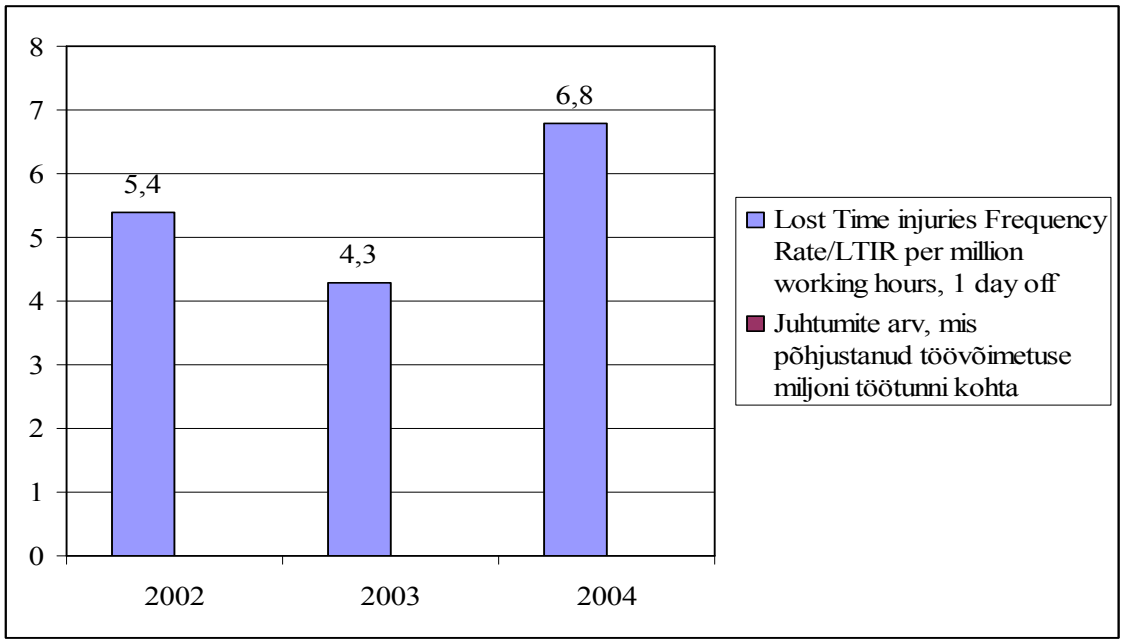

Figure 5.2 Lost time injuries Frequency Rate [2]

5.3 Environmental protection

5.3.1 Waste Management

Core parameter 2: non-hazardous waste for disposal

- Definitions: "waste", "hazardous waste" and "disposal" according to national definitions. In the absence of national definitions :
    - "waste": any subject or object set out in Annex I of Directive 91/156/EEC, which the holder discards, or intends to discard or is required to discard.
    - "disposal": any of the operations provided for in Annex IIA of Directive 91/156/EEC on hazardous waste (see Appendix 1).
- This parameter is expressed in **tonnes** and makes no distinction between on site and off site disposal.

- Significant amounts of soil, sent for remediation or disposal and included in the above figures, should be highlighted [4].

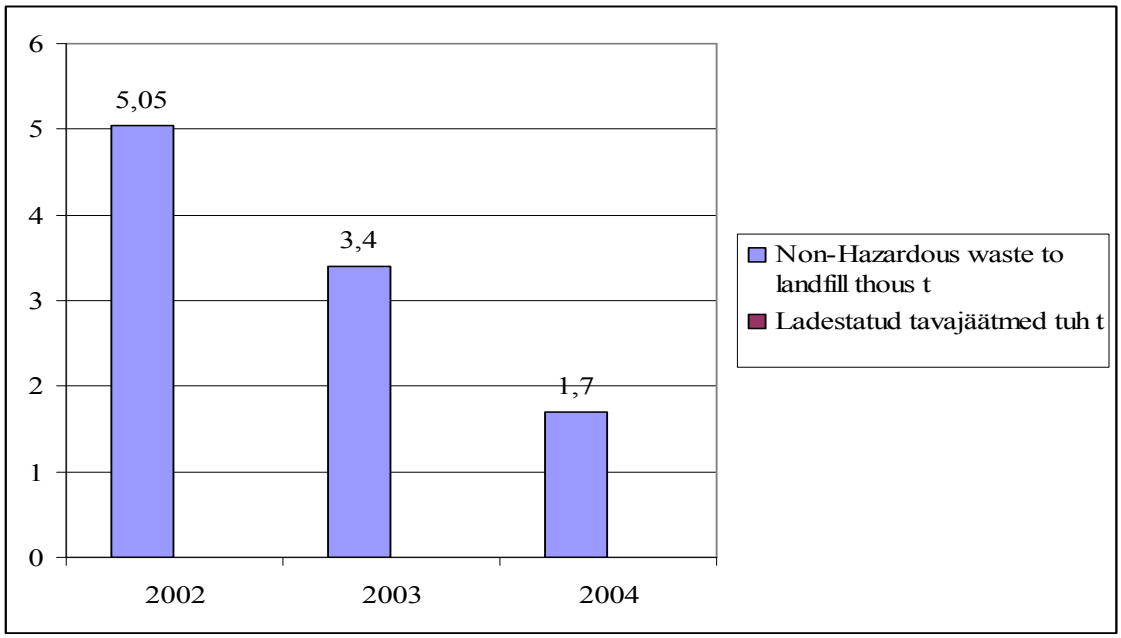

Figure 5.3.1.1 Non-hazardous waste to landfill [2]

5.3.2 Emissions to Air

Core parameter 3: volatile organic compounds (VOC)

- Definition: any organic compound having, at 293.15° K, a vapor pressure of 0.01kPa or more or having a corresponding volatility under the particular conditions of use, which is released into the atmosphere, Art 2.17 Council Directive 1999/13/EC - OJ L 85/1 1999 (Council Directive of 11 March 1999 on limitation of emissions of volatile organic compounds due to the use of organic solvents in certain activities and installations, OJ L 85/1).
- The parameter is expressed as **tones.**

- This parameter reflects the potential for photochemical ozone creation that is implicated in respiratory problems and ecological damage to plants [5].

This parameter is new and will be reported the first time about the year 2005.

5.3.3 Climate Change: Emissions of Global Warming Gases

Core parameter 4: carbon dioxide (CO_2)

- Definition: the major contribution to CO_2 direct emissions by the chemical industry is from the combustion of fuels. Therefore these emissions are considered to be a European core indicator. Reporting CO_2 emissions associated to electricity use (CO_2 indirect emissions) are to be reported as well but to be considered separately.
- The parameter on CO_2 is calculated as **tones of CO_2 equivalent** by multiplying the amount of solid, liquid and gaseous fuels used with corresponding CO_2 emission factors. Additionally the amount of CO_2 emissions associated with net purchased electricity is included. Additional guidance can be found in Appendix 2 [5].

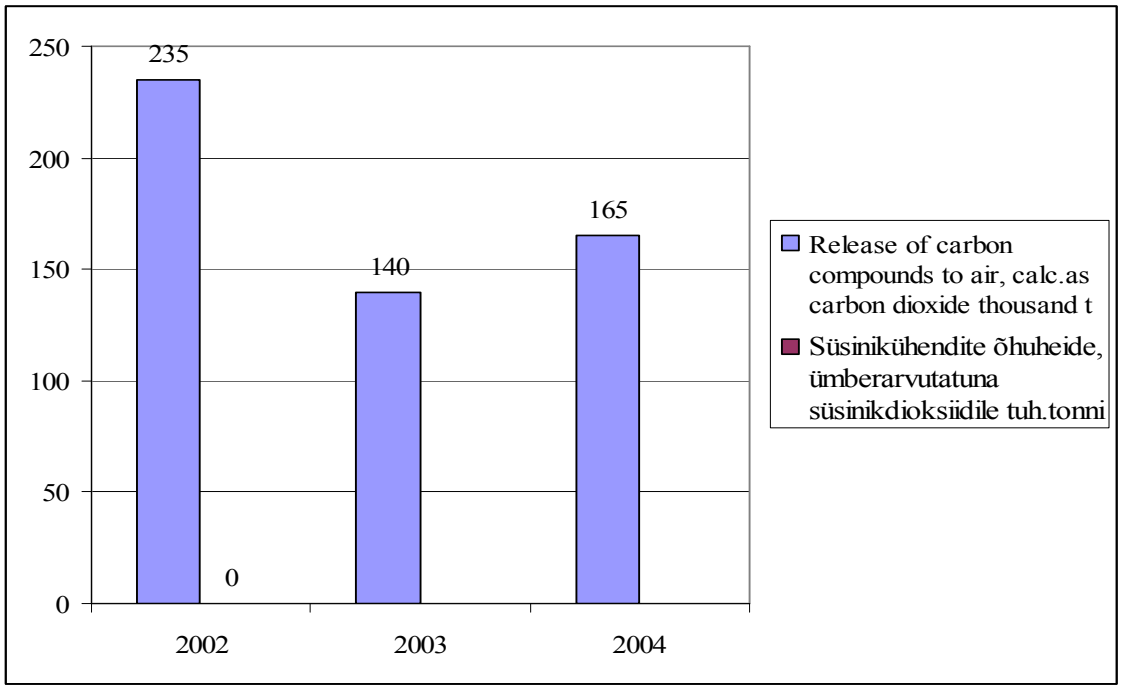

Figure 5.3.3 Release of carbon compounds to air [2]

5.3.4 Discharges to Water

Core parameter 5: chemical oxygen demand (COD)

- Definition: chemical oxygen demand (COD) is the amount of oxygen required for the chemical oxidation of compounds in water, as determined using a strong oxidant (most standard methods use dichromate).
- The parameter is expressed as **tones of oxygen.**
- This parameter reflects the potential impact of an adverse effect on the aquatic environment.
- For sites that have their wastewater treated at a shared third party unit and cannot obtain individual data, the efficiency factor of the wastewater treatment unit should be taken into consideration when calculating the amount [16].

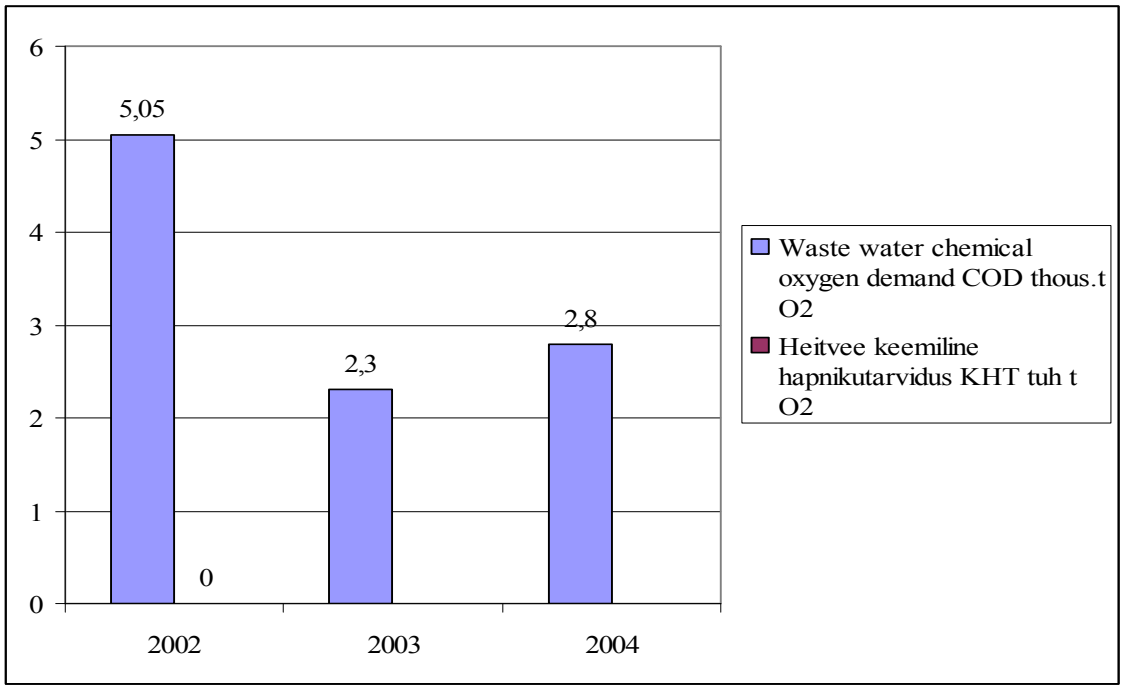

Figure 5.3.4 Waste water chemical oxygen demand [2]

5.3.5 Use of Resources

Core parameter 6: use of energy, specific energy consumption

- Definition: the use of energy is the amount of fossil fuels plus the net purchase of energy plus the self production of renewable energy. Specific energy consumption is the energy consumption per unit of output and is used as European core indicator of energy efficiency.
- The parameter on energy use is expressed as **tones of fuel oil equivalent (toe)**.
- The parameter on specific energy consumption is expressed as the **ratio of the total energy consumption to the volume of chemicals production in tones**.
- Further guidance on the reporting (use of energy and specific energy consumption) can be found in Appendix 3 [20].

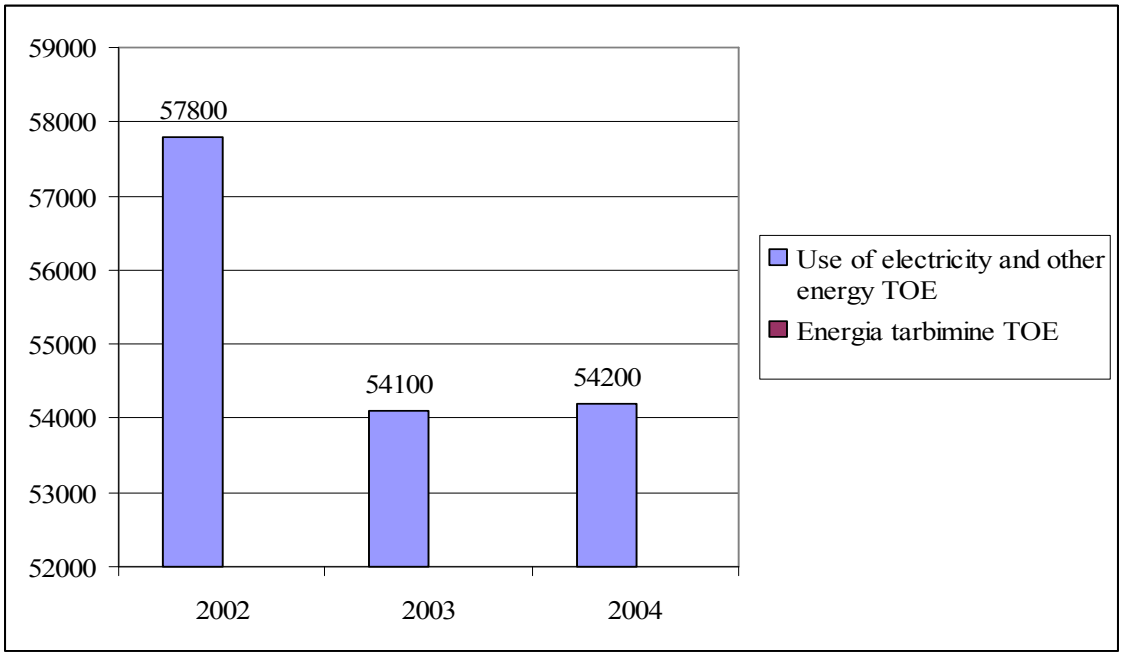

Figure 5.3.5 Use of Electricity and other energy [2]

Core parameter 7: water consumption

- Definition: water consumption is the use of fresh water (e. g. ground and surface water).
- The parameter is expressed as total amount of fresh water used in cubic meters.

This parameter reflects the use of the natural resource "water" [20].

This parameter is new and will be reported the first time about the year 2005.

5.4 Transportation

Core parameter 8: Transport incidents

- Definition: any incident during the transport of chemical products whether or not classified as dangerous according to the UN Recommendations for the Transport of Dangerous Goods (excluding loading/unloading at

supplier/final destination) which meets at least on of the following criteria:

- death or injury leading to intensive medical treatment, a stay in hospital of at least 1 day or to more than 3 day's absence from work, irrespective of whether or not the chemical product contributed to the death and/or injury;

- loss of product: any release of product of more than 50 kg/l of dangerous goods or more than 1000kg/l of non-dangerous goods;

- material or environmental damage: any damage of more than 50,000 Euro (including environmental clean up) resulting from a transport incident, irrespective of whether or not the chemical product contributed to the damage.

- involvement of authorities: direct involvement of authorities and/or emergency services in the incident, evacuation of people, closure of public traffic routes for at least 3 hours, caused by the transport incident.

The parameter is expressed as the **number of incidents/million tonnes distributed for each transport mode (air - rail - road - sea - inland waterway - pipeline)**. Further guidance on the reporting of transport incidents can be found in Appendix 4 [20].

This parameter is new and companies will report 2005 transportation incidence.

6 FUTURE VISIONS AND ANNUAL PLAN

The members of Responsible Care program are convinced that they are working for the future of chemical industries and contribute sustainable development.

Among the stakeholders there are many of people who have a difficulty to believe reality and efficiency of voluntary initiative. Often they say that: “The problem of voluntary initiative is that not everyone acts voluntarily”.

Everybody doesn’t believe that in chemical industries ethical acting is because of ethics. Employers say: “Keep minding that we are here to make a business”.

However, when the chemical industries realized what kinds of attitude have public, legislators and politicians into them and a fact that for chemical industry it might cost an activity license, they also looked through other possibilities, which were:

- *Don’t do anything*: it was equipotent with existing condition and consequences to agree with the future of chemical industries;
- *Argument, the public attention is only a trifling influence*. In the chemical industries dominate an opinion, that if they do everything right it doesn’t concern anybody. Imagination was a reality for the adverse public.
- *Change the cause of imagination*: it was a course of Responsible Care and the power of that course came into force: the chemical industry wise up their own interests.

If we finally had chosen our course, it doesn’t require high-level thinking or unsolved strategic questions. What must do is to implement this program so that companies will reach improvements. The achievements of these improvements are also visible and will reduce stakeholders concerns.

We managed to do annual plan, which will play an important roll of handling Responsible Care Program. Below are actions, what must be done during the year 2006.

Responsible Care Annual Plan

1. Self-Assessment Questionnaire:

- Answering to the questionnaire – deadline 20.02.2006
- Analysis of questionnaire – March/April 2006
- Making to Questionnaire – September 2006
- Answering to the new questionnaire – November 2006
- Analyzing and modifying the new questionnaire – December 2006

2. Global Charter:

- Translating the Global Charter into Estonian – March 2006
- Introducing the Global Charter to the member companies – May 2006
- Summary of the Global Charter – December 2006

3. Attitude:

- Communicating with the public (stakeholders): to make the booklet – June/September 2006

4. Homepage:

- Overview of all documents – February/May 2006

5. Program:

- Look through of joint declaration – June 2006

6. Translating and advertising:

- Overview of the indicators – March 2006
- Publishing the reported indicators as a booklet – May 2006

7. Seminars:

- Shearing the information about the indicators, self-assessment with the member companies from the other countries – October 2006

9. To have a better cooperation between member companies.

10. Responsible Care meeting – once in a quarter [22].

SUMMARY

In my master's thesis I concentrated on helping to understand responsible care and implement it in chemical industries. Responsible Care program help the chemical industries to drive continual improvement in all aspects of health, safety and environmental performance and to be open in communication about its activities and achievements.

I started on the 1st of November year 2004 as a member of Responsible Care committee in The Federation of the Estonian Chemical Industry. From that time I'm actively participating in Responsible care meeting. In my master's thesis I have used meeting protocols, results from the discussions and opinions.

The analyses of indicators are based on the reported indicators from the member companies. I direct attention to that reported indicators about the year 2002 are not very accurate, because each company reported two years old performances and these indicators were so hard to find and trust.

In my master's thesis I came to a conclusion that Responsible Care reliability depends on real acting's of chemical industries and publishing real success. Reported indicators are important elements of following and forwarding this success. Each respectful company must participate in Responsible Care program and belong to The Federation of the Estonian Chemical Industry.

Responsible Care program is voluntary and joined companies don't get direct financial profit. That is one important reason why this program is not very successful in Estonia. Even joined companies sometimes are very active and sometimes very lazy.

I think that Responsible Care initiative helps through the sharing of information and a rigorous system of checklists, performance indicators and verification procedures to develop companies' policy. Responsible Care enables the industry to demonstrate how it has improved over the year and to develop policies for further improvements. Continues improving is a comparing of measured results. What can't measure can't compare.

KOKKUVÕTE

Käesolev magistritöö on koostatud selleks, et aidata hoolimist ja vastutamist mõista ning rakendada seda ka keemiatööstuses. Hoolime ja Vastutame programmi eesmärgiks on säilitada ja demonstreerida tegevuse ja toodete mõju jätkuvat parendamist kõigis tervist, ohutust ja keskkonda puudutavates valdkondades.

Hoolime ja Vastutame komitee liikmeks hakkasin 1.novembril 2004.a. Sellest ajast peale olen aktiivselt osalenud Hoolime ja Vastutame koosolekutel. Töös on kasutatud koosolekute protokolle ja aruteludest saadud tulemusi ning arvamusi.

Näitajate analüüs on läbi viidud ettevõtete poolt esitatud näitajate põhjal aastate lõikes. Juhin tähelepanu sellele, et esitatud näitajad esimesel aastal (2002.a.) ei ole väga täpsed, kuna esitatakse iga kahe aasta taguseid näitajaid, siis nii vanu andmeid oli raske kohe kätte saada ja usaldada.

Käesolevas magistritöös jõudsin järeldusele, et Hoolime ja Vastutame usaldusväärsus sõltub keemiatööstuse tegelikust tegutsemisest ja saavutatud edu avalikustamisest. Tegutsemise näitajad on tähtsateks elementideks sellise edu jälgimisel ja edastamisel. Iga endast lugupidav ettevõte peaks osalema Hoolime ja Vastutame programmis ning kuuluma Eesti Keemiatööstuse Liitu.

Antud programm on vabatahtlik, millest liitunud ettevõtted ei saa otsest rahalist kasu. See on ka üks oluline põhjus, miks pole programm Eestis veel väga edukalt tööle hakanud. Ka liitunud ettevõtete aktiivsus kord elavneb ja siis jälle vaibub.

Arvan, et Hoolime ja Vastutame algatus aitab kaasa ettevõtete vahelise kogemuste jagamise ja omavahelise toetuse vastastikusele tugevnemisele, jättes tahaplaanile konkurentsi, kui asi puudutab tervishoidu, ohutust ja keskkonnakaitset. Algatusega ühinenud ettevõtted saavad võrrelda Keemiatööstuse Liidu kaudu oma parendatud tulemusi. Pidev parendamine on mõõdetud tulemuste võrdlemine. Mida ei saa mõõta, ei saa ka võrrelda.

LITERATURE

1. Euroopa Keemiatööstuse Nõukogu (CEFIC). Hoolime ja Vastutame programmi 2005.a aruandluse juhtnöörid. Brüssel 2005

2. Eesti Keemiatööstuse Liit. Aastaaruanne. Tallinn 2005

3. CEFIC-The Federation of the European Chemical Industry. Presentation Backbone to the Responsible Care Global Charter, Brussels 2006

4. Eesti Keemiatööstuse Liit Jäätmekäitlus. Tegevusjuhis. Tallinn 2002

5. Eesti Keemiatööstuse Liit. Saasteainete heitmine keskkona. Tegevusjuhis. Tallinn 2002

6. Eesti Keemiatööstuse Liit. Protsessiohutus. Tegevusjuhis. Tallinn 2002

7. Eesti Keemiatööstuse Liit. Tooted. Tegevusjuhis. Tallinn 2002

8. CEFIC-The Federation of the European Chemical Industry. Responsible Care Management Systems – Guidance. 4th Edition, 30 Jun 2003

9. Kastinen, A. Presentation of the Responsible Care Indicators and Reporting. Tallinn 17 Jan 2006

10. CEFIC-The Federation of the European Chemical Industry. Self-assessment of the Verification Responsible Care in the Company, Brussels 2002

11. CEFIC-The Federation of the European Chemical Industry. Responsible Care Management Framework and Guidance on Use. Brussels 2005 (http://www.cefic.be/Files/Publications/Man_Framework.pdf)

12. CEFIC-The Federation of the European Chemical Industry. Handbook of Responsible Care program. Version 30.10, Brussels 2001

13. CEFIC-The Federation of the European Chemical Industry. Responsible Care: Fundamental Features, (http://www.cefic.be/Templates/shwStory.asp?NID=3&HID=143&PHID=83)

14. Bach, J. M. Responsible Care Global Charter. Strengthening the International Commitment. Dublin 25th October 2005

15. ICCA – International Council of Chemical Association. Responsible Care Global Charter. Brussels 2006

16. CEFIC - The Federation of the European Chemical Industry. Responsible Care: Health, Safety and Environmental reporting Guidelines. Brussels 1998

17. European Chemical News. Responsible Care Annual Report. Europe 2003-2004. Charting the way ahead. Brussels 2004

18. European Chemical News. Responsible Care Annual Report. Europe 2004-2005. Making strides in Europe and the World. Brussels 2006

19. ICCA - International Council of Chemical Association. Responsible Care Status Report 1985-2005. Brussels 2006

20. CEFIC - The Federation of the European Chemical Industry. Responsible care Reporting Guidelines 2005. Brussels 2006

21. www.keemia.ee

22. Pärn, E. Hoolime ja Vastutame 2006.a tööplaan. Tallinn 2006

APPENDIXES

APPENDIX 1

Definition of "disposal"(Annex II A of Directive 91/156/EEC amending Directive 75/442/EEC on waste)
Disposal operations

Note: *This Annex is intended to list disposal operations such as they occur in practice. In accordance with Article 4, waste must be disposed of without endangering human health and without the use of processes or methods likely to harm the environment.*

D1 Deposit into or onto land (e.g. landfill, etc.)

D2 Land treatment (e.g. biodegradation of liquid or sludgy discards in soils, etc.)

D3 Deep injection (e.g. injection of pump able discards into wells, salt domes or naturally occurring repositories, etc.)

D4 Surface impoundment (e.g. placement of liquid or sludgy discards into pits, ponds or lagoons, etc.)

D5 Specially engineered landfill (e.g. placement into lined discrete cells, which are capped and isolated from one another and the environment, etc.)

D6 Release into a water body except seas/oceans

D7 Release into seas/oceans including sea-bed insertion

D8 Biological treatment not specified elsewhere in this Annex which results in final compounds or mixtures which are discarded by means of any of the operations numbered D 1 to D 12

D9 Physical-chemical treatment not specified elsewhere in this Annex which results in final compounds or mixtures which are discarded of by means of any of the operations numbered D 1 to D 12 (e.g. evaporation, drying, calcinations, etc.)

D10 Incineration on land

D11 Incineration at sea

D12 Permanent storage (e.g. emplacement of containers in a mine, etc.)

D13 Blending or mixing prior to submission to any of the operations numbered D 1 to D 12

D14 Repackaging prior to submission to any of the operations numbered D 1 to D 13

D15 Storage pending any of the operations numbered D 1 to D 14 (excluding temporary storage, pending collection, on the site where it is produced)

APPENDIX 2

1.CO_2 emissions

1.1 Data collection

As there is no direct measurement of CO_2 emissions, national associations and CEFIC calculate these amounts on the basis of energy consumption statistics.

1.2 Methodology

Only the consumption of fuels as energy sources is taken into consideration as far as direct CO_2 emissions are concerned, using the following working assumptions:

- Solid fuels = 100% steam coal
- Liquid fuels = 100% residual fuel oil
- Gaseous fuels = 100% natural gas (dry)

and applying the CO_2 emission factors reported below. If fuel specific carbon contents derived from representative analysis of individual fuel streams are available, these should be used in preference to the factors provided below.

CO_2 emissions associated to electricity consumption ("purchased electricity" minus "electricity sold to the network") are indirect emissions. The indirect emissions can be conventionally calculated with reference to the national average fuel mix for electricity (using for example IEA-OECD “Energy balances of OECD countries") That amount of electricity is then broken down into solid, liquid and gaseous fuels according to the average fuel mix and multiplied by the corresponding CO_2 emission factor for solid, liquid and gaseous fuels.

Note: National statistics data for electric energy consumption at sector level include electric energy purchases, but do not include electricity sold to the network. CEFIC suppose that Responsible Care companies have the information about the fraction of purchased electricity that is transferred to the grid, and so can give information about “net purchased electricity”.

CONVERSION FACTORS USED BY CEFIC				
	Carbon emission factor	Molecular weight ratio CO_2/C	CO_2 emission factor	CO_2 emission factor
unit	kg C/GJ	44/12=3.67	kg CO2/GJ	ton CO2/toe
SOLID				
steam coal	25.8	3.67	95	**3.961**
LIQUID				
crude oil	20.0	3.67	73	**3.070**
GASEOUS				
natural gas	15.3	3.67	56	**2.349**
Note: 1toe = 41.868GJ				

Example: Solid (as if steam coal)

since 1 GJ= 25.8 kg C (carbon)

1 GJ= 25.8 x 44/12 kg CO_2 (molecular weight ratio of CO_2 on C)

1 toe = 41.868GJ

1 toe = 41.868 x 25.8 x 44/12 kg CO_2

1 toe = 41.868 x 25.8 x 44/12 x 1/1000 ton CO_2

1 toe = 3.961 ton CO_2 (25.8 x 44/12 x 41.868/1000 = 3.961)

In some cases these types of calculations include consideration of oxidation factors (e.g. 0.98 for solid fuels).

The error margin resulting from these simplifying assumptions is weak as CO_2 emission factors are very close within a same class of fuels (see table below)

Carbon emission factors (CEF)			
Fuel	**Carbon Emission factor (kg C/GJ)**	**Fuel**	**Carbon Emission factor (kg C/GJ)**
Crude oil	20.0	Steam Coal	25.8
Gasoline	18.9	Coking Coal	25.8

Kerosene	19.6	Petroleum Coke	27.5
Jet Fuel	19.5	Lignite	26.1
Gas/Diesel Oil	20.2	Sub-bituminous Coal	27.6
Residual Fuel Oil	21.1	Peat	28.9
Naphtha	20.0[1]	BKB & Patent Fuel	25.8[1]
Bitumen	22.0	Coke	29.5
Lubricants	20.0[1]	Natural Gas (dry)	15.3
Refinery Feedstock's	20.0[1]	Natural Gas Liquids	15.2
Other Oil	20.0[1]	LPG	17.2

[1] This value is a default value until a fuel specific CEF is determined. Source: Greenhouse Gas Inventory Workbook Volume 2; IPCC/OECD Joint programme

1.3 Calculation

- Fossil fuels (direct $C0_2$ emissions):
  The amount of solid, liquid and gaseous fuels for energy use (self production of electricity and thermal energy) is multiplied by the corresponding CO_2 emission factors.
- Electricity (indirect $C0_2$ emissions):
  The amount of electricity used for the calculation of CO_2 emissions is "purchased electricity" minus "electricity sold to the network".
  That amount of electricity is then broken down into solid, liquid and gaseous fuels according to the average national electricity fuel mix (published for example in the IEA - OECD "Energy balances of OECD countries") and multiplied by the corresponding CO_2 emission factor for solid, liquid and gaseous fuels.

APPENDIX 3

1. Use of Energy

The energy sources used by the chemical industry can be split into two different energy requirements:

- the consumption of fuels as FEEDSTOCK (raw material)
- the consumption of fuels as FUEL & POWER (energy use).

The use of energy as defined in core indicator 16 is made up by the following components:

Energy = A plus B plus C

where:

- A is the use of fossil fuels (for energy purpose only)
- B is the net purchase of energy
- C is the self production of renewable energy and from other non fossil sources (e. g. from recovery of reaction heat, etc.)

1.1 Classification of fossil fuels

Fossil fuels defined as A above are classified as follows:

- Solid fuels:
  coking coal, steam coal, sub-bituminous coal, lignite, peat, coke oven coke and gas coke, patent fuel and brown coal/peat briquettes and petroleum coke.
- Liquid fuels:
  crude oil, natural gas liquids, refinery feedstock's, motor gasoline, aviation gasoline, jet fuel, kerosene, gas/diesel oil, heavy fuel oil, naphtha.
- Gaseous fuels:
  natural gas, ethane, LPG, butane, propane, coke-oven gas, blast furnace gas, refinery gas, gas works gas, and town gas. Excluded are those consumed by motor vehicles run by the chemical industry.
- Quantities of fossil fuels are measured in tons of oil equivalent (toe).

1.2 Classification of net purchase of energy

Net purchase of energy defined as B above is the amount of net purchase of thermal energy (B_t) plus net purchase of electric energy (B_e):

$$B = B_t \text{ plus } B_e$$

- ***N****et purchase of thermal energy (*B_t*)* is the amount of thermal energy purchased (Btp) minus thermal energy sold (Bts) (Bt = Btp minus Bts) and is measured by conversion in toe.
- *Net purchase of electric energy (****B****$_e$), i. e. electricity* is the amount of electric energy purchased minus electric energy, sold.
- The unit for electric energy i. e. electricity is the GWh. In order to add them up, quantities of electricity are converted into toe.
- Considering the primary energy required for the production of one GWh, the reference conversion factor amounts to 9767 GJ per GWh or 0.2332 ktoe per GWh. This reference factor is applied to those countries unable to deliver a national conversion factor. The conversion factor actually used for the other countries reflects the fuel mix of national public power stations.

1.3 Self Production of energy from non fossil sources

The definition of self production of energy defined as C above refers to energy self production from non fossil sources. The reason is that other forms of self production, thermal and thermo(electric) energy from fossil fuels are already accounted for with component A.

2. Specific Energy Consumption

2.1 Production index

The production index of chemicals for the European Union is a weighted geometric mean of chemical production indices in volume for the different countries. The weighting coefficients are the 1990 added values expressed in OECD purchasing power parities.

2.2 Calculation

The ratio, i.e. the index of fuel & power consumption divided by the production index, gives the specific energy consumption. A decrease in specific energy consumption means an improvement in energy efficiency.

	Specific energy consumption =	fuel & **power** energy consumption ---------- volume of chemicals production	

APPENDIX 4

Transport incidents

1. Background

Under its Responsible Care initiative, the chemical industry is committed to continuously improve the Health, Safety and Environmental performance of its transportation activities whereby the prevention of incidents is highly important.

Internal reporting of transport incidents is already common practice in most chemical companies and offers individual companies a solid basis for carrying out risk assessments and taking remedial actions. Common industry reporting criteria are however necessary to demonstrate performance improvements to the public in a comprehensive way.

2. Objective

These guidelines intend to promote the reporting of transport incident data according to common definitions and criteria. This approach should lead to consistent reporting by individual companies, by national chemical federations at national level and by Cefic at European level. This will contribute to an improved exchange of information and will stimulate continuous reduction of chemical transport incidents.

3. Definitions and criteria

3.1. Definitions

Transport

The "in-transit" transport by all modes of transport (air - rail – road – sea – inland waterway – pipeline) of chemicals between the site of a supplying

chemical company and that of the final destination, excluding the transport and loading/unloading activities at the premises of the supplying chemical company and the final destination.

Chemicals

All chemical products, including not only finished products, but also samples, raw materials, intermediates, wastes, etc., whether or not classified as dangerous according to the UN Recommendations for the Transport of Dangerous Goods.

3.2. Reporting criteria

All incidents during the transport of chemicals, meeting one or more of the following criteria, should be reported:

a. Death - Injury

Death or injury, where the injury

- requires intensive medical treatment, or
- requires a stay in hospital of at least one day, or
- results in the inability to work for at least three consecutive days

irrespective of whether or not the chemical product contributed to the death and/or injury.

b. Loss of product

Any release of product of

- more than 50 kg/l of dangerous goods (classification according to the UN Recommendations for the Transport of Dangerous Goods), or
- more than 1000 kg/l of non-dangerous goods.

c. Material damage or environmental damage

Any damage exceeding 50,000 Euro, to the property of any party (including environmental clean up), resulting from the transport incident, irrespective of whether or not the chemical product contributed to the damage.

d. Involvement of authorities

Direct involvement of the authorities or emergency services in the transport incident or the evacuation of persons or closure of public traffic routes for at least three hours caused by the transport incident.

4. Collection and reporting process

4.1. Data to be collected

The following data should be reported:

- The total number of transport incidents by transport mode, split by bulk (tanks, tank containers) and packaged (cans, drums, bags, IBCs, etc.)
- The total number of transport incidents with product loss (see paragraph 3.2.b)
- The total volume (tonnage) transported by each transport mode.

See section 4.4 for suggested format of data collection.

4.2. Reporting

The reporting process should consist of the following steps:

Step 1: Each shipping point of a chemical company collects the incident data for all transport shipments originating from this shipping point.

Step 2: Each chemical company collects the data for all its shipping points and reports the aggregated data per country to the respective national chemical federations.

Step 3: The national chemical federations report the incident data and volumes, aggregated at national level, to Cefic.

4.3. Indicators of performance

The following indicators of performance should be used

- number of incidents per transport mode
- number of incidents per 1 million tones carried per transport mode

4.4. Suggested format for data collection

Mode of Transport	Number of incidents				Total volume transported (tones)
	Bulk	Packaged	Total	Total with product loss (see 3.2.b)	
Air					
Rail					
Road					
Sea					
Inland waterway					
Pipeline					
Total					