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Voluntary commitments

Sustainable Development

from the PVC industry

Sustainable Development

Voluntary commitments from the PVC industry

This paper describes actions being undertaken by the European PVC industry to ensure that its product is compatible with sustainable development. A review of product stewardship activities is presented at a time when PVC is being considered by the European Commission as the focus of a Horizontal Initiative.

The Brundtland Commission described the challenge of sustainable development as **"meeting the needs of the present without compromising the ability of future generations to meet their own needs."** This encompasses a combination of environmental, social and economic criteria. The European PVC industry, represented by ECVM, ECPI, ESPA and EuPC[1], is responding to this challenge.

The European PVC market, including additives will reach approximately 8.3 million tonnes in 2000, with the value of finished PVC goods estimated at 75 billion euro. Over the past few years, the industry has been working towards a product stewardship approach with two key aims:

- To work towards improving quality of life and adding value to society through PVC products and innovations that assist with sustainable economic growth;
- To introduce new practices that protect the integrity and diversity of the environment based on the principles of sustainable development.

In order to respond to the 'sustainability challenge' and make a positive contribution to the debate over PVC, the industry is committed to pursuing activities which are aimed at fulfilling:

The needs of the present: to continuously improve the health & safety, environmental and socio-economic aspects of the PVC industry;

The needs of the future: to develop voluntary commitments that ensure the PVC industry will always operate in a sustainable manner.

1 The term European PVC industry refers to the following associations: European Council of Vinyl Manufacturers (ECVM), European Council for Plasticisers and Intermediates (ECPI), European Stabilisers Producers Association (ESPA) and European Association of Plastics Converters (EuPC)

1 Needs of the present

1.1 Health & Safety

The PVC industry seeks to improve its contribution to health & safety standards in modern society. PVC provides the material for products that ***protect and preserve life***. Here are a few examples of how PVC is used in these essential applications:

- The safety and reliability of PVC makes it by far the ***most widely used medical polymer***. It is used for the benefit of patients in applications ranging from blood bags and catheters through to operating theatre floors. It has a proven track record of over 40 years use within the healthcare sector and meets stringent hygiene standards.
- PVC pipes are used worldwide to ***provide clean water supplies***. They are equally important for collecting used water and sewage, thereby providing sanitation and protecting health. The functionality and low-cost of PVC pipes make them particularly important in developing economies.
- PVC ***packaging protects and preserves products***, including many foods. It keeps foods fresh and uncontaminated, protects public health and prevents unnecessary waste of foodstuffs.
- Tough, reliable PVC is the material for ***survival equipment*** such as life jackets, rescue boats, air safety equipment, vehicle air bags and protective clothing.

1.2 Environment

The European PVC industry is pursuing an ***integrated approach*** aimed at minimising environmental impacts associated with each stage of the PVC lifecycle.

In implementing this approach, the industry has voluntarily set tough environmental standards for production and is developing improved solutions for the end-of-life management of its products.

A number of independent studies have been published in the last few years to evaluate the environmental impact of various PVC products[2].

One such study is a report by the German Council of the Environmental Advisors (SRU), which states that PVC related health and environmental risks – compared to substitutes – cannot be considered serious enough to justify a ban or wide restrictions.

PUTTING POLICY INTO PRACTICE...

Risk Assessment

PVC and the products into which it is converted must comply fully with the toughest health and safety standards. The PVC industry is therefore committed to appropriate risk assessments. Working with the chemical industry worldwide, such initiatives are continually progressing on an international level, involving stakeholders from within many application sectors.

A number of the SRU study recommendations are already being pursued by the PVC industry, such as an increase in the level of recycling and planned phase out of cadmium based stabilisers.

The integrated approach being pursued by the industry covers each stage of the lifecycle[3], from ***responsible manufacturing*** and ***resource efficiency***, through to ***recovery*** and ***final disposal***. The European PVC industry is committed to applying the principles of ***Responsible Care®*** throughout all of its actions (see section 2.2).

2 See Appendix 5
3 See Appendix 1
4 See Appendix 5

PUTTING POLICY INTO PRACTICE...

Open Dialogue

In a series of extensive workshops over a period of 30 months, experts from German PVC producers and converters conducted an extensive dialogue with scientists, NGOs and journalists. The results, known as the Prognos Study[4], assessed the contribution of four PVC products to sustainable development by evaluating their ecological, social and economic impact. PVC pipes, windows and cables proved to have good short and medium term potential for sustainable development, while special applications of PVC rigid films showed favourable short and long-term prospects.

The results of the Prognos Study highlight areas for the industry to focus on in their efforts to achieve the long-term sustainability of PVC products.

The experts recommended a strategy for all of the product groups investigated to the PVC industry that attempts to maintain the short and medium term market position by means of continual improvement. For example, by reducing weight, increasing heat insulation and increasing recycling for PVC window frames. However, Prognos stressed that it was difficult to take long-term investment decisions as the relevance of future risks remains uncertain.

1.2.1 Responsible Manufacturing

A key element of ***product stewardship*** is responsible manufacturing. The industry acknowledges concerns that have been raised over the environmental impact of PVC production in recent years and has been working voluntarily to address them.

Commitment towards continuous environmental improvement is illustrated by the two ***voluntary Charters*** signed by European PVC producers over recent years that establish tough environmental standards for production ahead of legislation. The proactive nature of this work was confirmed in 1998, when countries signed up to the OSPARCOM Convention unanimously adopted standards contained within the PVC industry Charters in their efforts to address industrial emission levels contributing to environmental pollution.

PUTTING POLICY INTO PRACTICE...

ECVM Industry Charters[5]

The first voluntary charter for PVC production was signed by European producers back in 1995. Independent auditors announced in 1999 that the industry had achieved 88% compliance with targets that had been set within this ground-breaking charter for suspension PVC (S-PVC) production. Companies that did not fully comply have been working on solutions to achieve compliance and will have formulated implementation plans during 2000.

In February 1999, ECVM members signed a new Charter to cover PVC produced by the emulsion process (E-PVC), thus ensuring virtually all European PVC production is covered by environmental standards that go beyond the requirements of regional, national and local legislation. Compliance with the E-PVC charter will be independently verified in 2003.

These two Charters demonstrate the industry's commitment towards continuous environmental improvement and how this commitment is translated into action.

There has been considerable debate around the use of additives in the production of PVC. All polymers, including PVC, require additives such as stabilisers, plasticisers and processing aids.

Stabilisers are necessary in all PVC formulations to prevent decomposition by heat and stresses during processing. They also have an important influence on the physical properties of PVC. The main constituents of stabilisers are metallic compounds derived from lead, barium, tin, calcium or zinc. The use of stabilisers is regulated for use in pipes for potable water, medical and food-contact applications, by a combination of EU Directives and existing National Regulations. The EU Packaging Directive prohibits the use of some stabiliser systems.

Flexible PVC uses plasticisers to give it the desired properties for a number of applications. These substances have been the subject of considerable media, legislative and scientific debate.

Plasticised PVC has been used for more than 40 years without a single known case of it having caused any ill-health, and the environmental effects of plasticisers are known to be minimal. Academia and industry have continually worked together to address the concerns and conduct necessary research. The latest research findings are an invaluable input to the EU risk assessments which are currently being carried out on plasticisers.

As part of its Voluntary Commitment (see section 2.1), the European PVC industry will continue to invest in research that brings a better understanding of the environmental and health issues surrounding PVC additives. The use of additives within production will continue to be based on ***sound scientific risk assessments*** and the industry will work with European Authorities to ensure their approach remains in line with the principles of sustainable development.

1.2.2 Resource Efficiency

One of the main resources used in PVC production is common salt, which remains available in large quantities. This means that PVC requires less oil for production than some other polymers and also emits less carbon dioxide if incinerated at the end of its useful life. It is a plastic that can be recycled on an industrial scale for most of its applications and the PVC industry is working towards this goal by investing in the development of recycling technologies across Europe.

A large proportion of PVC products have long lives, ensuring that maximum use is made of the natural resources consumed in their manufacture. By selecting PVC for some applications, the resulting products have been shown to be more ***durable*** and therefore take longer to enter the waste stream.

For example, PVC window profiles have an estimated lifecycle of between 40 and 100 years. This means that the volume of PVC window profiles reaching the end of their useful life is currently much lower than the volume of production.

5 The full text of the Charters can be obtained by contacting ECVM, see Appendix 6 for details.

Many PVC products allow ***multiple and continued use***, with single-use products normally restricted to applications in which safety and hygiene are key considerations, e.g. food packaging and medical products. This property, along with the recyclability and durability of PVC make it one of the most resource efficient materials available for many applications.

PUTTING POLICY INTO PRACTICE...

Material of choice for construction

PVC is durable – 53% of products last for over 35 years – lightweight and strong, making it a popular choice for the building and construction industry. In 1999, approximately 5.7 million tonnes of PVC products were used for construction around Europe.

Many PVC products, such as pipes and roofing membranes, are used in the construction of important infrastructure such as public buildings, pipelines and road tunnels, as well as essential housing.

1.2.3 Recovery: an integrated solution

The European PVC industry is working to develop environmentally responsible solutions for managing its products at the end of their lifecycle. A number of recovery options are available before final disposal, with the appropriate mix defined by the most cost-effective and efficient process for each waste stream.

1.2.3.1 Mechanical Recycling

Mechanical recycling makes ecological and economic sense where sufficient quantities of homogeneous, separated and sorted waste are available.

PUTTING POLICY INTO PRACTICE...

Closing the loop on pipes

In 1990, the Dutch Federation of Manufacturers of Plastic Piping Systems (FKS) decided to directly address recycling PVC piping systems by developing a recovery infrastructure and techniques to provide high quality reprocessed material.

The reprocessed material is used for the co-extrusion of non-pressure sewage pipe. A co-extruded pipe has external compact layers of virgin PVC, whilst the intermediate layer consists of scrap material regenerated from collected waste.

FKS co-funded a lifecycle analysis study of recycled PVC pipes in comparison with alternative materials. This showed they had advantages in respect of energy use, air pollution and waste over pipes made from other materials. The key conclusion from the study was that recycled pipes produced by the FKS scheme had a comparable environmental profile to traditional concrete and clay pipes.

In these cases, the quality of recycled material often allows for production of the same or similar products. Products such as pipes, roof coverings and window profiles are currently being recycled in this way within a number of EC member states. The PVC industry is seeking to expand these recycling programmes across Europe through a number of activities included within its Voluntary Commitment (see section 2.1).

Mechanical recycling of mixed plastic waste is also possible to a limited extent. The PVC industry recognises the need to improve sorting and recycling techniques for mixed plastic waste, and will be seeking to improve the situation through actions included within the Voluntary Commitment.

Composite products are particularly difficult to recycle because of the need to separate polymer fractions from other materials. However, the PVC industry has recently been successful in developing new techniques for recycling composite products such as tarpaulins, blister packs, cables, automotive parts and coated fabrics. These are now being developed commercially on an industrial scale.

PUTTING POLICY INTO PRACTICE...

Dissolving the Problem

A closed-loop recycling process called Vinyloop has been developed by one PVC producer which involves shredding waste, dissolving it in a solvent solution to separate the components and recovering the PVC by precipitation, separation and drying. This technique produces a high grade recycled PVC compound that can be used for extrusion, calendering or injection purposes.

1.2.3.2 Feedstock Recycling

Feedstock recycling is particularly well suited to mixed plastics waste.

A number of feedstock recycling technologies are currently under development. All are based on the principle of breaking down PVC into its chemical components, which can then be recovered for re-use within a range of industrial processes to manufacture new products. In the case of a PVC rich feedstock, hydrochloric acid is one of the main components recovered via this method. This can be re-used as a raw material in the PVC production process.

PUTTING POLICY INTO PRACTICE...

Feedstock Future

The PVC industry is investing in industrial trials to develop effective feedstock recycling technologies as a sustainable waste management option for its products at the end of their useful life.

For example, some 3 million euro is being invested in a new pilot plant located in France. With a capacity of up to 2,000 tonnes a year, this is the first project of its size within Europe. It will be operational during the first quarter of 2001 and results from the trial are expected later in the year.

The project will run for 2-3 years with the aim of establishing a proven and efficient feedstock recycling process.

1.2.3.3 Incineration with energy recovery

Incineration with energy recovery ensures that the calorific value of oil used in PVC production is recovered, potentially after many years of efficient service.

Incorporating PVC waste in controlled municipal incinerators reduces the need for additional fuel. A number of independent studies have demonstrated that adding PVC to an incinerator waste stream in which chlorine is naturally present does not increase the generation of potentially harmful emissions.

PUTTING POLICY INTO PRACTICE...

Research into PVC Incineration

A study by the Dutch TNO Institute of Environmental Sciences, Energy Research and Process Innovation[6] concluded that the overall negative public perception of PVC in municipal waste incineration is not supported by scientific, financial or ecological evidence.

It also found that the complete elimination or even a strong decrease of PVC from the waste stream would not lead to any substantial ecological gain.

PVC usually represents less than 1% by weight of the material handled in a typical municipal waste incinerator. Moreover, modern incinerators are operated to the highest standards and equipped with pollution control equipment that minimises the formation or release of emissions to the environment. This ensures they operate to strict EU emission levels. Concerns have been expressed over the volume of solid waste residue created by the pollution control processes employed within incinerators handling PVC waste.

When lime is used as the neutralisation agent for acidic gaseous emissions produced by the incineration process, the concentration must be sufficiently large to absorb the levels of chloride resulting from PVC combustion. When sodium bicarbonate is used as an alternative neutralisation agent, the quantity of residue produced is lower.

The PVC industry is currently involved in the development of appropriate techniques for handling solid waste residues arising from the pollution control processes employed when incinerating municipal waste containing PVC. One such initiative is operational in Italy, whilst another is currently being constructed in France.

1.2.4 Disposal

Whatever the nature of the recovery process, there is always a residual fraction of waste which is not recyclable. For this limited fraction, ***controlled landfill*** remains the most appropriate final disposal option.

PUTTING POLICY INTO PRACTICE...

Landfill is an option for PVC disposal

An independent study[7] released during 1999 confirmed that the presence of PVC in landfill does not constitute a significant risk to the environment. The three-year research project also concluded that landfill should not necessarily be rejected as a waste management option for this widely used material.

The study was carried out by experts from three universities in Germany and Sweden, and in consultation with the Swedish Environmental Protection Agency. The long-term behaviour of various PVC products was evaluated through laboratory simulation exercises and analysis of leachate samples from full-scale landfill sites.

The research revealed that PVC is resistant to breakdown under landfill conditions and does not produce vinyl chloride. Although partial loss of plasticisers and stabilisers may occur, concentration levels in leachate do not constitute a risk to the environment. Metal levels within leachate are also not affected by the presence of PVC in the waste stream.

In conclusion, the PVC industry is currently working to establish effective integrated waste management solutions for both short and long life PVC products. Whilst there are a number of recycling schemes already operational across Europe, many of these have the potential for increasing their capacity if the availability of recyclable material is improved. The PVC industry will be seeking to maximise the potential of existing recycling schemes and support their further development through its actions incorporated within the Voluntary Commitment.

6 See Appendix 5

7 See Appendix 5

1.3 Socio-Economic Value and Improved Quality of Life

PVC provides the material in a multitude of forms for ***innovative products*** that enhance the quality of life.

The PVC industry contributes to modern society with a variety of goods carrying added value, many of which play a role in economic and social development. Here are a few:

- The PVC industry adds value to society through the significant ***employment and wealth*** it creates.
- The industries directly linked to PVC production – such as converters and machinery manufacturers – as well as the polymer producing industry, are significant employers. PVC directly and indirectly supports over ***530,000 jobs*** throughout Europe.
- The European PVC Market will reach approximately ***8.36 million tonnes*** in 2000 with European sales estimated at ***74 billion euro***.
- The contribution that PVC makes to economic development around the world is reflected in the relationship between consumption and Gross Domestic Product (GDP).
- PVC consumption generally outpaces GDP in many countries with the difference being most marked in developing economies and emerging markets. This is largely a result of natural growth in consumer demand for products and services (e.g. construction, transport, packaging and healthcare).
- PVC is durable, lightweight, strong and naturally fire resistant (without the need for flame retardants), making it an important material for the construction of ***housing and important infrastructure projects*** such as public buildings, pipelines and tunnels.
- PVC provides ***long-lasting and cost-effective solutions*** for roofing, window frames, electrical equipment, flooring, wall-coverings and even complete pre-fabricated houses. The use of PVC in these applications brings reduced maintenance costs (e.g. no repainting of window frames) and improved living standards (e.g. affordable double-glazing systems).
- PVC provides cost-effective and durable components for many ***transport applications***, including aeroplanes, trains, lorries and cars. The use of PVC and other plastics makes modern vehicles longer-lasting, lighter, more fuel efficient and therefore cheaper to run.

PVC not only enhances living standards but also the ***quality of life***, particularly in the field of design. For many designers, PVC provides the raw material in a multitude of forms for products such as furniture, lighting, textiles and clothing.

All economies benefit from the use of PVC as it provides access to a range of products and services, from affordable home improvement to medical equipment. This helps to ***improve living standards*** and promote economic well being, particularly in developing countries and emerging markets.

2 Needs of the future

The PVC industry is working voluntarily to ensure that it meets the needs of the future by operating according to sustainable development principles within the framework of the chemical industry's Responsible Care® programme. This voluntary approach is in line with the UNEP statement: 'a true efficiency policy is based on voluntary commitments.'

Following from its voluntary commitments within the two Charters for PVC production (see section 1.2.1), the industry is working towards a series of new commitments which are set out in the document "The PVC Industry Voluntary Commitment".

PUTTING POLICY INTO PRACTICE...

The PVC Industry Voluntary Commitment and Responsible Care®

1. The contract: ***"formal commitments are taken to apply policies and reach goals";*** **In an effort to go beyond existing standards, the European PVC industry has formally agreed to commitments which will establish measurable goals in its drive towards sustainability.**

2. The consultation: ***"consultation with all stakeholders on agreed targets and objectives from production to end-of-life";*** **All sectors working within the industry, from PVC manufacturers to additive producers and converters, have signed up to the Voluntary Commitment. The industry will be consulting and involving stakeholders in the various activities that will be developed to meet these commitments.**

3. The content: ***"defined action lists with quantitative objectives and timetables are specified";*** **The PVC industry has set out measurable targets with intermediate (2005) and final (2010) goals within the framework of the Voluntary Commitment, which will be regularly controlled and monitored.**

4. The control: ***"the results are verified and audited by independent bodies";*** **An independent third party will verify and evaluate progress by the PVC industry against the Voluntary Commitment. The objectives will be reviewed in 2003 and again in 2008 so that targets can be revised in the light of technical developments and stakeholder comments.**

5. The communication: ***"to develop the open and transparent dialogue with all involved parties".*** **The PVC sector is developing a dialogue at various levels (local, national, European) with stakeholders through a variety of initiatives: environmental reports, visits, open days, participation in discussion forums, publication of data and information. This dialogue is promoted and managed at various levels, from European trade associations, down through the member companies to individual site level.**

The Voluntary Commitment sets out an approach based upon ***partnership*** and common commitments from each part of the PVC supply chain, involving all the members of the following four industry associations:

- ECVM (PVC producers)
- ECPI (PVC plasticiser producers)
- ESPA (PVC stabiliser producers)
- EuPC (PVC converters)

2.1 Voluntary Commitments for the Future

The Voluntary Commitment is designed to:

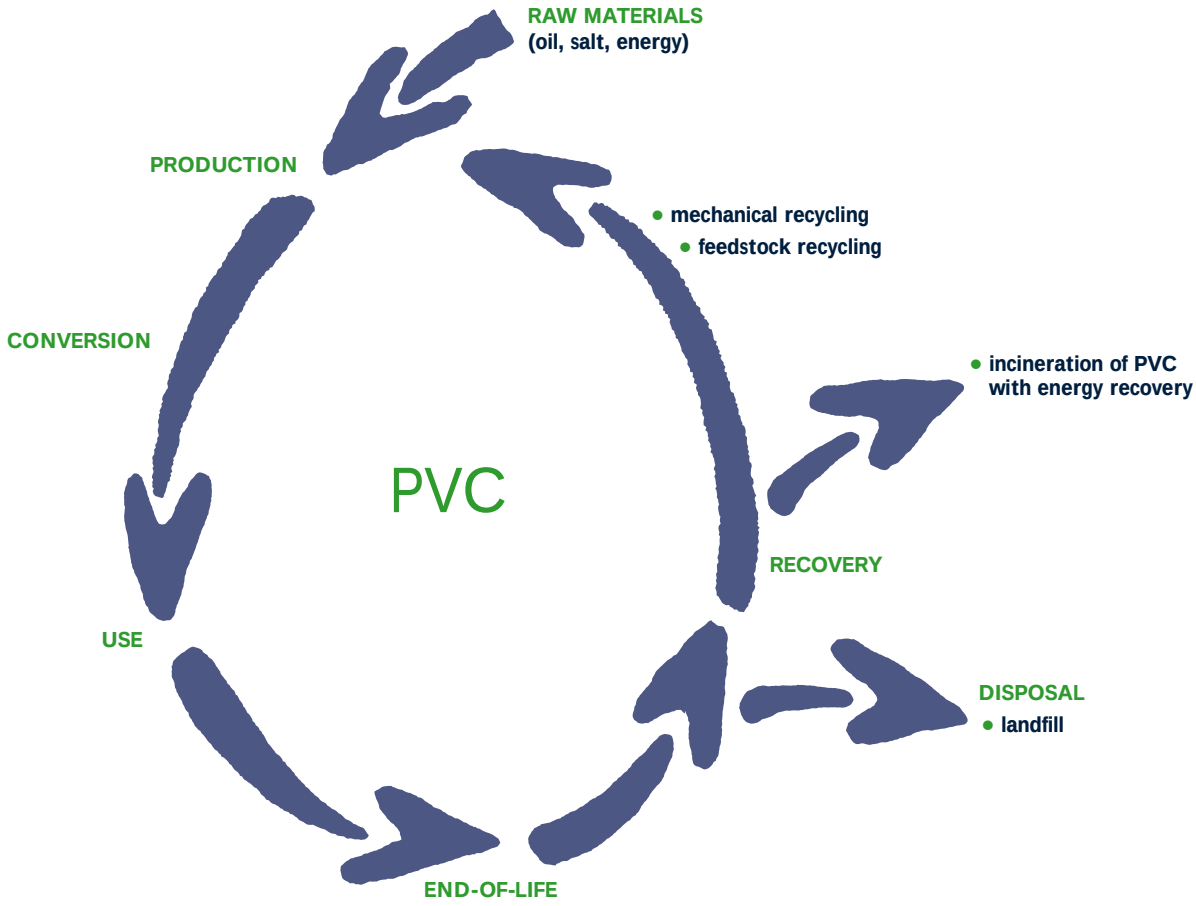
- Continually ***improve environmental quality*** through more efficient use of non-renewable natural resources (energy and raw materials), the minimisation of wastes and emissions, and the optimisation of PVC applications in products and services during their lifecycle;
- Address customers', consumers and society's views relating to PVC applications in order to provide ***sustainable products*** which correspond to their real needs;
- Define ***specific targets*** within this Voluntary Commitment for the period 2000-2005, which will be controlled by an independent body. They will then be re-defined to cover the period 2005-2010;
- Develop further the ***socio-economic value*** of PVC through its contribution to improving health and living standards, to covering essential material needs, providing employment, supplying market innovation, technology transfer and economic wealth.

2.2 Responsible Care®

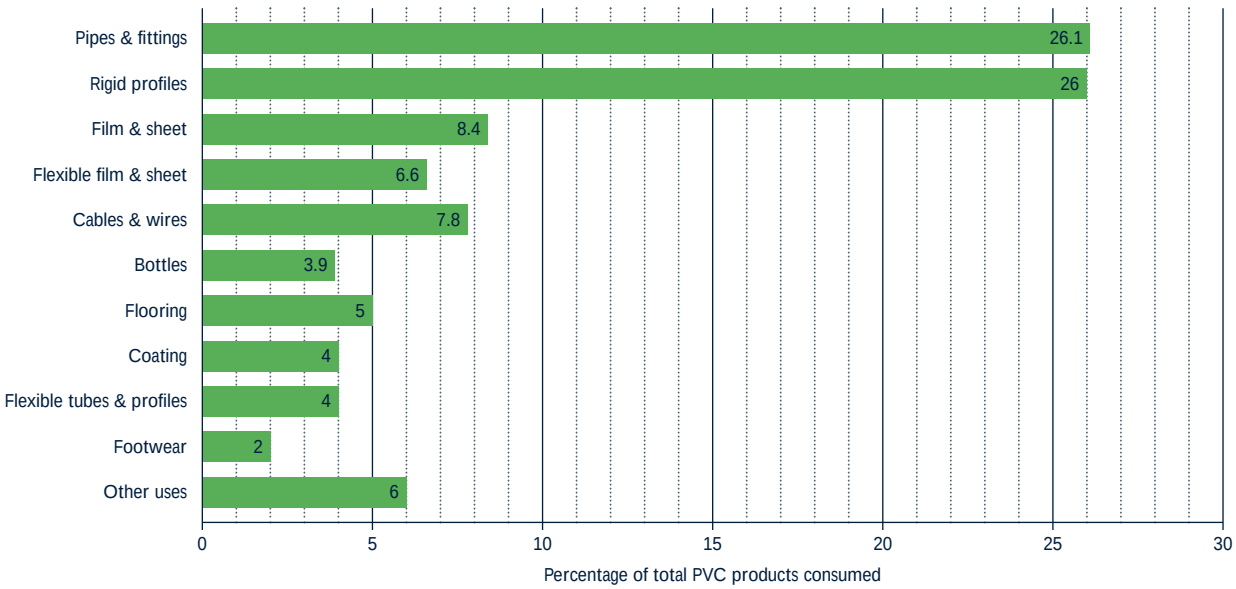
The Responsible Care® programme is a voluntary approach adopted by the global chemical industry to continually improve its health, safety and environmental performance, and achieve openness in its communications. Responsible Care® is the route through which the chemical industry is working to incorporate the principles of sustainable development into all aspects of its operations. It is based upon the dynamic and continuous application of codes of practice articulated in five successive steps.

The European PVC Industry hopes that all stakeholders will become involved in developing these and future voluntary initiatives to ensure progress towards sustainable development is achieved.

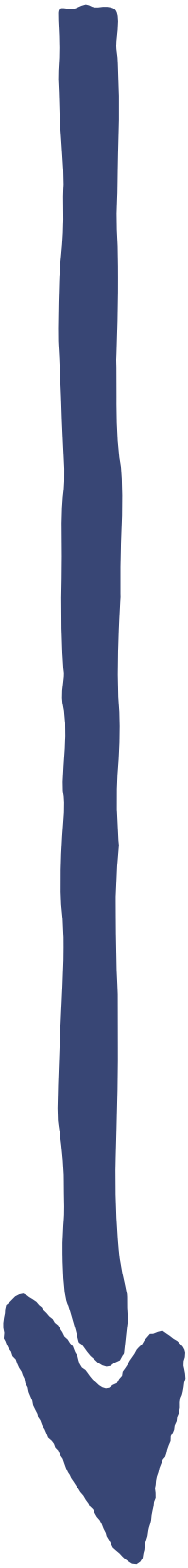
Appendix 1: The PVC Lifecycle



Appendix 2: PVC Applications in Western Europe, 1998



Appendix 3: PVC Product Stewardship Initiatives



1994	Report on the environmental impact of the manufacture of PVC – a description of best available techniques produced by ECVM
1995	Voluntary Charter for Suspension PVC signed by leading European PVC producers
1996	Independent study of PVC in landfill commissioned by ECVM, ECPI and ESPA ECVM adopts its policy on PVC waste management & recycling Prognos Study on sustainability of PVC commences
1997	Report on PVC feedstock recycling technologies produced by ECVM
1998	EU commissions five studies into PVC waste management as part of its Horizontal Initiative
1999	Voluntary Charter for Emulsion PVC signed by leading European PVC producers Independent verification of S-PVC Charter compliance Largest feedstock recycling trial in Europe commissioned by ECVM Independent study on PVC in landfill results published Prognos Study results published
2000	PVC industry Voluntary Commitment signed Independent re-verification of S-PVC Charter compliance ECVM feedstock recycling trial plant becomes operational
2001	First results from ECVM feedstock recycling trial plant Annual report on the PVC industry's progress against the Voluntary Commitment
2002	Independent verification of E-PVC Charter compliance Annual report on the PVC industry's progress against the Voluntary Commitment
2003	Intermediate review of Voluntary Commitment objectives Annual report on the PVC industry's progress against the Voluntary Commitment
2004	Annual report on the PVC industry's progress against the Voluntary Commitment
2005	Independent verification of intermediate goals within Voluntary Commitment Annual report on the PVC industry's progress against the Voluntary Commitment

Appendix 4: Definition of terms

Definitions for some of the terms used within this paper are provided below:

Additives
Materials that are blended with polymers to make them easy to process and give the physical properties required in the end-application. Before PVC can be made into products, it has to be combined with a range of special additives. The essential additives for all PVC materials are heat stabilisers and lubricants; in the case of flexible PVC, plasticisers are also incorporated. Other additives that may be used include fillers, processing aids, impact modifiers and pigments.

Best Available Techniques (BAT)
BAT is the latest stage in development of activities or methods which indicate the suitability of techniques for preventing or minimising emissions to the environment, without predetermining any specific technology or other techniques.

Chlorine
A gaseous element obtained from rock salt used as a raw material or intermediate for manufacturing a wide range of solvents, pharmaceuticals, insecticides, herbicides and plastics, including PVC. Chlorine is essential to the chemical industry, as it allows efficient use of raw materials and energy in the production of numerous compounds which would be difficult or impossible to synthesise using other pathways.

Compound
A compound is the blend of polymer resin and additives relevant to a specific application. PVC compounds are made into products using a variety of processing methods that include extrusion, injection moulding, blow moulding, calendering, spreading and coating.

Dioxins
Dioxins are the general name given to 210 organic compounds containing carbon, oxygen and hydrogen with one to eight chlorine atoms. They are created naturally through the break down of chlorine compounds during events such as forest fires, volcanic eruptions and even compost heaps. They are also formed as by-products of industrial processes such as metal smelting, incineration, internal combustion and the manufacture of chlorine-containing chemicals. Only 17 of the 210 dioxins are known to be toxic.

Emulsion PVC
Emulsion PVC (E-PVC) is produced using water, vinyl chloride monomer and an initiator soluble in water. Emulsion PVC applications are mostly plastisols and calendering, profiles, flooring, wallcoverings, coated fabrics and sealants.

End-of-life
The final stage in a material or product lifecycle. Materials or products at the end of their life can no longer be re-used and must be sent either for energy recovery, recycling or disposal.

Ethylene
The simplest unsaturated hydrocarbon, ethylene is used as a raw material in the production of polyethylene and vinyl chloride, the monomer of PVC.

Fire retardant
All thermoplastics are flammable to a greater or lesser extent. PVC – because of its chlorine content – does not ignite easily nor does it continue to burn when the heat source is removed, making it fire retardant.

Feedstock recycling
Feedstock recycling is a form of material recycling, particularly well suited to mixed plastics waste. The technology breaks plastics down into their chemical constituents. These can be used as building blocks for a wide range of new industrial intermediate and consumer products. In effect, the plastics are reprocessed at the place of origin, the petrochemical complex.

Fillers
Fillers are inert materials, such as talc, that are blended with polymers. They can be used to modify mechanical or electrical properties of a compound, and to enhance its fire retardance. Fillers are also used as extenders

so that the cost of the polymer blend is reduced.

Heavy metals

This term has no agreed definition but lead, cadmium, tin and the essential element zinc are frequently associated with this term. Lead compounds are the most cost effective and commonly used stabilisers in Europe, whilst cadmium systems are now largely replaced in Europe.

Horizontal Initiative

In 1997, as part of the debate on managing end-of-life vehicles, the European Commission embarked on the Horizontal Initiative. The purpose of this review was to gather information on environmental and socio-economic factors associated with the PVC lifecycle, focusing particularly on waste management.

During the initial stage, five independent studies on different aspects of PVC waste management were commissioned. First results from these studies are expected in April 2000. The Horizontal Initiative is being tackled in an innovative way, with co-responsibility between DG Enterprise and DG Environment leading to joint decisions on EC policy development.

Industry charter

ECVM has two industry charters, one covering production of PVC by the suspension process and the other covering PVC produced by the emulsion process. These charters contain tough environmental standards for production and give commitments of cross-industry co-operation and agreement including research, sharing environmental control expertise and working with stakeholder groups.

Incineration

The burning of material to convert it, at least partly to gases, to reduce its bulk and sometimes recover the energy it contains. Incineration (with energy recovery) is important as a sustainable waste management option for PVC.

Landfill

Landfills are carefully engineered waste disposal sites. Their aim is to provide a safe and controlled environment into which waste can be deposited and where it is subject to biological breakdown. Engineering solutions are employed to ensure that landfills do not cause pollution in the form of emissions to water and air, or have a negative visual impact on the surrounding landscape.

Lifecycle Assessment

Lifecycle Assessment (LCA) is a technique for assessing the potential environmental impacts throughout a product's life (i.e. cradle-to-grave) from raw material acquisition through production, use and disposal.

Lubricants

Lubricants are additives used to regulate the rate at which plastics melt during processing and to provide controlled friction between plastics melt and metal surfaces. Lubricants are often waxes or metallic soaps.

Mechanical recycling

The process by which an end-of-life product is reprocessed into the same or alternative second-life applications. In the case of thermoplastics that reprocessing will be melt processing very similar to that originally used.

Mechanical recycling makes ecological and economic sense whenever sufficient quantities of homogeneous, separated and sorted waste streams can be made available. Products collected for recycling this way include bottles, flooring, pipes, roof coverings and window profiles.

OSPARCOM

The Convention for the Protection of the Marine Environment of the North-East Atlantic was opened for signature at the Ministerial Meeting of the Oslo and Paris Commissions in Paris during 1992. This is concerned with the pollution of the sea by materials originating on land. Most of the countries bordering the North East Atlantic area, the North Sea and the Baltic Sea are represented.

Plasticiser

These are organic compounds, sometimes mixed with polymers to make a more flexible plastic. The commonest plasticisers are the phthalates, adipates and citrates. By product type, some 35 per cent of PVC is used for plasticised applications.

Polymer

An organic material composed of long-chain molecules made up of many monomer units. Most polymers have a chain backbone of carbon atoms. Polymers are almost always

blended with additives before use.
Plastics = polymers + additives.

Processing aids
Processing aids, including lubricants, enhance the extrusion characteristics and physical properties of finished products made from PVC. They are usually fatty alcohols or esters, waxes or metal soaps such as calcium stearate which can also aid thermal stability.

Recycling
The conversion of materials from end-of-life products into second life applications. This second life may be a repeat of the first or something entirely different.

Recyclable
A material or product that is capable of being recovered via mechanical or feedstock recycling is said to be recyclable.

Renewable resource
Resources that can be reproduced by natural processes at a rate that matches or exceeds human consumption, e.g. salt, solar energy. Non-renewable resources are produced by natural processes, but at a slower rate than human consumption, e.g. oil, coal, natural gas.

Responsible Care®
Responsible Care® is the world-wide chemical industry's commitment to continual improvement in all aspects of Health, Safety and Environment performance and to openness in communication about its activities and achievements. National chemical industry associations are responsible for the detailed implementation of Responsible Care® in their countries.

Stabiliser
A stabiliser is a complex mixture designed to have a preventative and curative action in PVC, during processing and to protect the product during its life, including photodegredation. PVC degrades by dehydrochlorination, autooxidation and mechanochemical chain scission and the stabiliser has to prevent these different mechanisms. It also has to remove polyene sequences which give rise to colour development.

Suspension PVC
Suspension PVC (S-PVC) is produced using water, vinyl chloride and an initiator that is soluble in the monomer. The main applications for this type of PVC are pipes, cables, rigid profiles, building applications and injection moulding.

Sustainable development
The Brundtland Commission described the challenge of sustainable development as "meeting the needs of the present without compromising the ability of future generations to meet their own needs". This encompasses a combination of environmental, social and economic criteria.

VCM
Vinyl Chloride Monomer (VCM) is the monomer building block for the production of the PVC polymer.

Appendix 5: References

A list of key references is provided below. If you would like additional references please contact one of the PVC industry trade associations listed in Appendix 6.

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Der Rat von Sachverständigen für Umweltfragen Postfach 55 28
D-65180 Wiesbaden
Tel: +49 611 75 4210 fax: +49 611 731269
Internet: http://www.umweltrat.de
e-mail: sru@uba.de

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Umweltbeauftrager Schachenstrasse 77
CH-8645 Jona tel (55) 221.63.00
fax (55) 212.61.34 e-mail: info@geberit.com
http:// www.geberit.com

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CH-9014 St Gallen.
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Appendix 6 Contact Details

If you would like more information on the PVC Industry Voluntary Commitment or any of the issues raised within this document, please contact any of the organisations listed below:

The European Council of Vinyl Manufacturers (ECVM)
Represents the European PVC producing companies and is a division of the Association of Plastic Manufacturers in Europe (APME). Its membership includes the 10 leading European PVC producers which together account for over 95 per cent of Europe's production of PVC resin.

Avenue E van Nieuwenhuyse 4
B-1160 Brussels
Tel: + 32 2 676 74 43
Fax: + 32 2 676 74 47
www.ecvm.org

The European Stabilisers Producers Associations (ESPA)
ESPA represents the whole of the European stabilisers industry through its five branches:

- European Cadmium Stabilisers Association (ECADSA)
- European Lead Stabilisers Association (ELSA)
- European Tin Stabilisers Association (ETINSA)
- European Mixed Metal Solid Stabilisers Association (EMMSSA)
- European Liquid Stabilisers Association (ELISA)

Avenue E van Nieuwenhuyse 4
B-1160 Brussels
Tel: + 32 2 676 72 86
Fax: + 31 2 676 73 01

The European Council for Plasticisers and Intermediates (ECPI)
ECPI represents the interests of 26 member companies that are involved in the production of plasticisers. Plasticisers are esters (mainly phthalates) which are used generally in the production of flexible plastic products, predominantly PVC.

Avenue E van Nieuwenhuyse 4
B-1160 Brussels
Tel: + 32 2 676 72 60
Fax: + 32 2 676 73 01
www.ecpi.org

European Plastics Converters (EuPC)
EuPC represents approximately 30,000, predominantly medium-sized, plastic processing operations in Europe. These companies have over one million people on their payrolls, 85% of whom work for companies that employ less than 100 people. The individual members combine to produce a processing capacity of more than 30 million tonnes of plastic every year.

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ECVM


EuPC


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ALCOHOLS PLASTICISER RANGE


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