Sustainability Report 2007-2008

Absorbent Hygiene Products

Prepared by:
The Absorbent Hygiene Products
Manufacturers Committee of EDANA

Foreword from the Chairman

In 2007, the year of Europe's 50th birthday, we are delighted to present EDANA's second **Sustainability Report**, an initiative of our Absorbent Hygiene Products Manufacturers Committee's (HAPCO) Sustainability and Environmental Working Group.

In the same year that the Treaty of Rome was signed, a Swedish firm, building on the first disposable diaper developments of the 1940s, developed a 2-piece diaper, which consisted of a disposable wad of shredded paper pulp covered with gauze which was inserted into reusable plastic pants. Heralded by mothers at the time as one of the greatest inventions of the 20th century, parents today can now enjoy the benefits of fifty years of research & development and innovation of this life-changing product, which has brought huge benefits to society in terms of hygiene, health, comfort and convenience.

This edition of the **Sustainability Report** is an update of the 2005 Report rather than a completely new report. We have sought to extend the amount of information available within the public domain about our industry and its impact on social, environmental and economic aspects of life in modern society. Our ongoing commitment means that we are continuously improving our sustainability performance and we are able to update the information contained in the 2005 Report with data from 2005 and 2006. We have also extended this report to contain data on the feminine care category of absorbent hygiene products; that is sanitary pads, pantyliners and tampons. In future editions we plan to further extend the scope of the Report to include other nonwoven products used for hygiene care.

The launch of our **Sustainability Report** in 2005 was a significant landmark, for both our public stakeholders and our industry.

EDANA members want to play their part in the public stakeholder debate on sustainability, a principle which we, as an industry, fully endorse. Despite the measurable progress over the years in their environmental profiles, our products have often been subjected to one-sided criticism; our **Sustainability Report** was a first important step towards correcting misinformation and misguided perceptions. The Report is also simply one of the many important testimonies to the fact that EDANA members believe in the importance of sustainable development and are committed to striving for continual improvement in all of its aspects, be they social progress, environmental performance or economic growth.

For our members, the **Sustainability Report** was an important milestone as it was the first of its kind for the absorbent hygiene products industry, and indeed it is still unique in the world, demonstrating EDANA's pioneering ethos and global leadership role. We hope that it will provide inspiration for, not only the absorbent hygiene products industry in other regions around the world, but also for other sectors of the nonwovens supply chain.

The absorbent hygiene products industry is keen to be among the best performers in terms of sustainability. We recognise that, although we have accomplished many achievements, the sustainability journey is ongoing and we are ever-mindful of our responsibilities to present and future generations.

Gerd Ries

Chairman of the Board of EDANA

Foreword from the General Manager

EDANA's mission is 'to create an environment beneficial to innovation and sustainable and profitable growth of the industry participants through dialogue with stakeholders and the active promotion of sustainable development, consumer/end-user interests and transparency'. This is fully in line with today's global drive for increased sustainable development.

The **Sustainability Report** is just one aspect of EDANA's sustainability programme. We have established a Board Working Group on Sustainability which, composed of sustainability and environmental experts from our member companies, helps our members deal with sustainable development both at company level and as an industry, and provides guidance on the integration of sustainability across our business practices. Our conferences also provide our members with the opportunity to acquire increased knowledge and know-how on sustainability. Our annual Nonwovens Symposium and OUTLOOK Personal Care Products Conference both feature dedicated sessions on our industry's practices, progress and challenges in sustainability.

The 2007-2008 **Sustainability Report** is part of an industry initiative to increase knowledge and understanding of the societal benefits and sustainability of absorbent hygiene products and personal care wipes and the social responsibility of the industry.

There can be no question about the numerous benefits that baby diapers, incontinence and feminine hygiene products bring to today's society, in terms of improved quality of life, cleanliness, healthier skin, independence, cost-effective convenience, and of utmost importance to incontinence sufferers, the additional essential benefits of mobility and dignity. In addition to outlining these undisputed societal benefits, this second edition of the **Sustainability Report** clearly demonstrates the important role absorbent hygiene products play in the two other key dimensions of sustainable development, namely, responsibility for the environment and maintenance of high and stable levels of economic growth and employment.

Member companies grouped within EDANA have, for many years, been at the forefront of industry environmental management, for example, with the publication of Environmental Guidelines in the early 1990s, even before the introduction of the Eco-Management and Audit Scheme (EMAS). We have also established a tradition of voluntary industry cooperation and codes of practice in various areas such as product safety. In recent years we have demonstrated ongoing environmental awareness, with the investment of time and resources in several Life Cycles Analyses (LCA) on baby diapers and incontinence products, and of course our first **Sustainability Report** published in 2005.

As a result of this early environmental awareness, and as a consequence of the many innovations introduced within this industry throughout the supply chain, the environmental impact of absorbent hygiene products has been measurably reduced over the past two decades, as illustrated by this report.

Our dynamic and fast-growing industry contributes considerably to the European economy and competitiveness, as advocated by the Lisbon Strategy. The European Council recently urged "Business leaders and other key stakeholders including workers' organisations and non-governmental organisations to propose an ambitious business response in support to the implementation of the EU Sustainable Development Strategy" (EU SDS) which addresses seven themes including sustainable consumption and production.

We are proud of these achievements in sustainability to date as well as being ever mindful of our ongoing responsibilities. Our industry supports responsible environmental stewardship in its manufacturing processes and acknowledges that our products do contribute a small fraction of the overall household waste stream. Manufacturers strive constantly to improve the overall environmental profile of their products, and waste reduction is a key focus area. Over the past 17 years the industry has achieved around a 40% reduction in the overall weight of baby diapers. Producers have ensured that the products are compatible with prevailing forms of household waste management. This commitment and the evidence in this report should be a source of reassurance for consumers and stakeholders.

EDANA and its member companies endeavour to continue this positive trend and welcome the opportunity for open dialogue with responsible authorities at all levels, as well as with consumer and environmental organisations, to be part of the solution to today's sustainable development challenges.

Pierre Wiertz
General Manger, EDANA

EU acknowledgement

EUROPEAN COMMISSION
ENTERPRISE AND INDUSTRY DIRECTORATE-GENERAL

Industrial policy and economic reforms
Sustainable Development, Climate Change and Competitiveness

Brussels, 20 SEP. 2007
ENTR/B4/KK D(2007) **29927**

Mr Pierre Wiertz
General Manager
EDANA, International Association Serving
the Nonwovens and Related Industries
157 Avenue Eugène Plasky
B – 1030 Brussels

Subject: EDANA's Sustainability Report 2007-2008

Dear Mr Wiertz,

I am writing to you on behalf of Mr Zourek, Director General of DG Enterprise and Industry.

We would like to thank you for sending the executive summary of the second edition of EDANA's Sustainability Report that I have read with interest.

As indicated to you at the time of the first edition of your Sustainability Report, and more recently during our meeting of 12 June 2007, DG Entreprise and Industry welcomes EDANA's voluntary initiatives on sustainability and more particularly your members' commitment to contribute to the continuous improvement of environmental performance of absorbent hygiene products while highlighting their societal, economic and health benefits.

This is in line with the business response which is expected from sectors in support of the implementation of the EU Sustainable Development Strategy which addresses seven themes including sustainable consumption and production.

DG Enterprise and Industry has encouraged EDANA to continue its efforts in the improvement of their products environmental impact and I am pleased to learn that new achievements have been brought since 2005.

I therefore would like to reiterate our appreciation of the absorbent hygiene products manufacturers voluntary initiatives on sustainability of their industry and products and I am confident that your industry sector will be able to demonstrate progress on the environmental impact of their products in the near future.

Yours sincerely,

Michel Catinat

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1. Introduction

Since the first edition of our Sustainability Report in 2005, the question of sustainability has moved even higher on society's agenda and is at the forefront of many people's minds, including our consumers.

Issues related to sustainability affect everything that we do – where we live and how we live, where we work and what we do, what we consume, what our open spaces look like, how we travel, how we view the communities within which we live and how we think about the future. No generation before us has focused so sharply on these issues as we do today. Government focus at international, regional, national and local levels is firmly fixed on climate strategy. Interest is not just limited to governments and environmental groups however, as was witnessed by the high level of interest stimulated amongst the general public by the release of Al Gore's film "An Inconvenient Truth" in cinemas around the world in 2006.

This report is an update to the first edition published in 2005. In that first edition we provided information on sustainability issues as they relate to the manufacturers of baby diapers and incontinence products. We sought to assess the impact of our industry on all aspects of sustainability; be they social, environmental or economic. We aimed to bring together, in one place, comprehensive and up-to-date reference information about the impact of our products on quality of life considerations, the environmental impact of our processes and products, our stewardship of resources and about the size of our industry and its contribution to the European economy.

This second edition of the Sustainability Report is an update of the 2005 report rather than a completely new report. Our ongoing efforts mean that we are continuously improving our sustainability performance and as a result we have been able to update the information contained in the 2005 report, with data from 2005 and 2006. We have also extended this report to contain data on the feminine care category of absorbent hygiene products; that is sanitary pads, pantyliners and tampons.

The material used in this report has been collated by the manufacturers of absorbent hygiene products in Europe who are members of the Absorbent Hygiene Products[1] Manufacturers Committee (HAPCO)[2] of EDANA, the international association serving the nonwovens and related industries. Unless otherwise stated, the data used in this report relates to the geographic area of the current European Union (EU27). Where data has not been available within the public domain we have used our best endeavours to make estimations in good faith whilst protecting commercial confidentiality. We have also drawn on a wide range of resources available within the public domain and as a reference for readers we have listed those resources in Appendix 2.

[1] Throughout this document the term Absorbent Hygiene Products is used as a collective noun to describe disposable diapers, adult incontinence products and feminine care products - sanitary pads, pantyliners and tampons.

[2] For a full list of HAPCO members see www.hapco.edana.org/contacts. For contributors to this review see Appendix 3 of this document.

The structure of this report follows, with some minor modifications, the structure of the 2005 Report. It includes:

- the definition of sustainability we have adopted as an industry;
- a historic overview of the development of absorbent hygiene products;
- the structure and composition of current absorbent hygiene products;
- the societal benefits of absorbent hygiene products;
- the industry's approach to social responsibility;
- the environmental impact of absorbent hygiene products as measured by life cycle assessments;
- our use of natural resources;
- waste management considerations;
- our approach to the use of broader environmental and financial instruments;
- economic data about the market and the industry.

A glossary of the terms used in the report is included as appendix 1.

This is an industry report; as such it documents historic industry-wide achievements and our broad commitment to ongoing improvement. Inevitably it is generic in nature because it represents the collated achievements of a number of member companies. As yet it does not include industry-wide key performance indicators. We will however consider the feasibility and desirability of establishing industry-wide performance indicators before we produce our next report and we will follow closely the development of methodologies for assessing carbon footprint to determine how best to apply them to our products.

Comments on this review are welcome and should be directed to:

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2. Sustainable Development

The concept of sustainable development or sustainability seeks to reconcile economic development with environmental protection and social responsibility around the world. The 1987 Bruntland Report of the UN World Commission on Environment and Development offered a definition of sustainable development which has informed much of the debate and discussion that has occurred in ensuing years. It defined sustainable development as "development that meets the needs of the present, without compromising the ability of future generations to meet their own needs".

There have been many elaborations of this definition since then. While they may differ in emphasis or expression, essentially they all encompass the concept of achieving economic and social development which brings improvements in lifestyle and wellbeing, while conserving resources and protecting the environment.

Drawing on these definitions, in our approach as an industry, we focus on the three fundamental pillars of sustainability: social benefit, environmental stewardship, and economic growth and employment. Our sustainability reporting is presented to reflect these three pillars.

In our 2005 Report we recognized that the challenge of improving the sustainability profile of absorbent hygiene products is an ongoing one. We continue to accept this challenge. We believe we can demonstrate an excellent record of improvement to date. Innovation has delivered products that give better performance, with reduced resource use and reduced environmental impact; all at an affordable price. However, sustainability is not static; rather it is a continuous process of improvement and balance. By addressing all aspects of sustainability – social, environmental and economic – manufacturers are committed to improving the overall sustainability profile of absorbent hygiene products and at the same time helping to improve people's lives around the world.

"We focus on the 3 fundamental pillars of sustainability: social benefit, environmental stewardship and economic growth and employment."

3. An Overview of the Development of Absorbent Hygiene Products

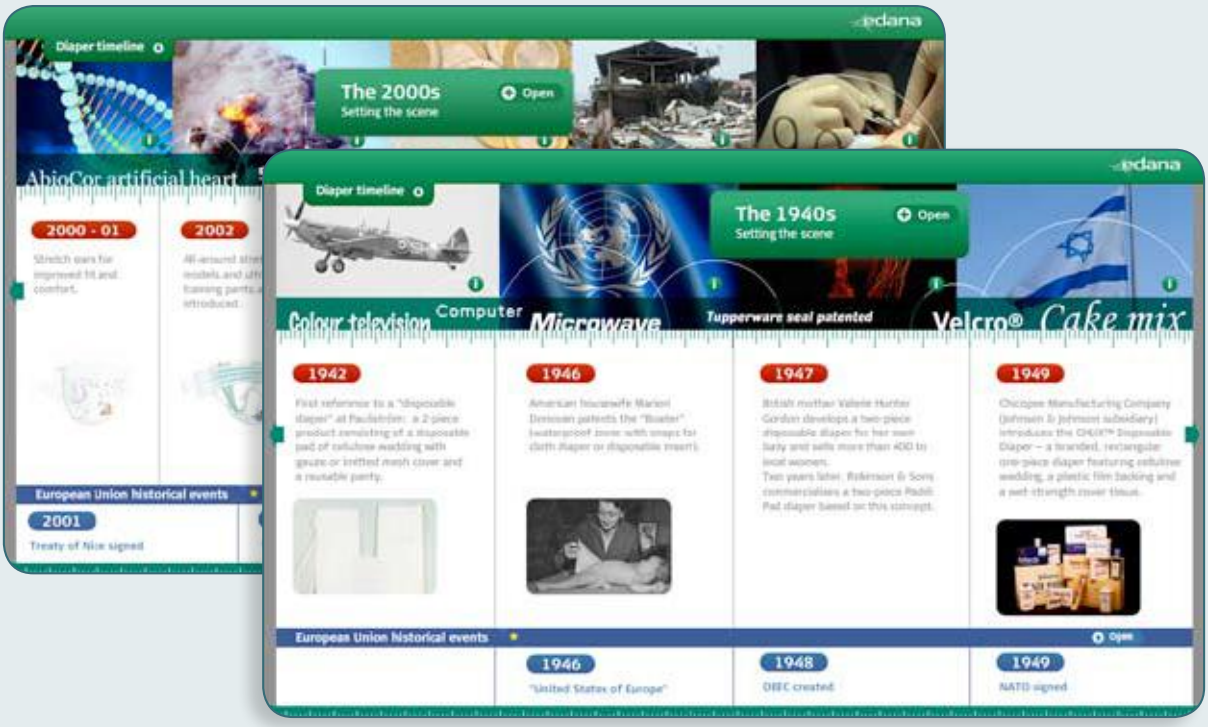
People have needed products to contain bodily fluids since time immemorial so it is not surprising that the history of modern absorbent hygiene products dates back to ancient times. In the baby care sector swaddling clothes were used with an absorbent inner layer, to provide cover, protection and containment. In the feminine hygiene sector, both internal and external protection products were known at least 3500 years ago. Today's absorbent hygiene products offer a level of sophistication, comfort and discretion unthought-of by previous generations but taken for granted today as an everyday essential of modern life by millions of people throughout the world.

Baby Diapers

Before 1936 diapers were mainly either cotton-based ribbed towelling or a cotton muslin type material both of which, with laundering, could be reused. These typically took the form of a square of material which was wrapped around the baby and fixed in place with safety pins. The diaper was then covered with reusable plastic or rubber pants with elasticized leg openings.

In the late 1930s early forms of tissue-based disposable under pads and diaper inserts were introduced in Sweden. Developed by Paulström Bruk, a number of versions of this basic product emerged between 1936 and 1942 including the use of rubber pants to hold the cellulose pad in place. In 1950 the company introduced a new version of the product based on bleached cellulose wadding with a knitted mesh outer layer which could be inserted into a holding pocket in a rubber pant. In the same year Johnson & Johnson introduced a rectangular under pad product based on cellulose wadding with wet strength tissue as the cover-stock and plastic as the backing. In 1957 SCA Hygiene Products (formerly Mölnlycke) introduced a 'pear shaped' insert formed from de-fibred wood pulp with a knitted mesh cover.

Diaper Timeline on EDANA website: www.hapco.edana.org



The convenient disposable baby diaper is a relatively new invention; credited to Marion Donovan who in 1950 cut her shower curtain into plastic envelopes into which she slipped absorbent material, using snap closures to secure the diaper on her baby. This form of disposable diaper was an immediate success, due largely to the time saving attractions it offered to the increasing number of working mothers. However, the disposable baby diaper revolution began in earnest in 1961 when Procter & Gamble introduced the first disposable diaper in the USA, based on cellulose wadding with a plastic backing and a nonwoven top sheet. Subsequent developments saw the introduction of fluff pulps in place of dissolving grade wood pulps, the addition of adhesive tapes and the use of plastic back sheets.

Further developments in the mid-1980s owed much to the availability of improved superabsorbent polymers and better methods to add the polymer to the pulp core, as well as innovations such as frontal and re-sealable tapes, and elasticized waists. The introduction in 1989 of the first disposable training pants by Kimberly-Clark created a product to assist in the transition from the child's diapering period to successful toilet training. Training pants have less absorption than a conventional diaper resulting in reduced comfort when wet. The pant itself is more underwear-like in design and is easier for the child to put on and remove during toilet training. Recently this product segment has evolved to include several innovative features intended to trigger the child to prefer using the toilet as well as the introduction of trainers with higher levels of absorbency for use at night. In 1991 the first pant diaper was introduced. This product category has the same absorption capabilities as the conventional open diaper. With its higher absorbency and the fit of a pant diaper, it provides an alternative to diapers for children starting to crawl, walk and move around.

Disposable diapers today are much thinner and more absorbent than their earlier counterparts and as a result are more effective. They are more comfortable for the infant to wear and more convenient for parents to use. In addition their usage has been accompanied by a marked reduction in skin irritation in individual children and a decrease in the spread of infectious disease amongst children in group care environments.

Feminine Care Products

Disposable pads were first commercially available around 1895 with several of the first disposable pad manufacturers also being manufacturers of bandages. However, at that time the subject of menstruation was not openly discussed and the market was slow to progress because of the difficulties of product promotion and the product's perceived expense. Their usage gained momentum during the First World War when nurses used wood pulp bandages to catch their menstrual flow, creating a pad that was made from easily obtainable materials and inexpensive enough to throw away after use. Successful commercialization commenced in the 1920s since when the use of disposable menstrual pads has become pervasive in the industrialized world.

During the 1970s and early 1980s menstrual pad product development was significantly influenced by developments in baby diapers and as experience was gained in one field, it was rapidly incorporated into the other.

One of the most significant developments was the use of hot melt adhesives in self adhesive pads. These products could be held in place by glue lines on the back of the pad, which fixed the product in position within the normal panty garment, eliminating the need for belts and pins.

Further developments focused on facilitating better fluid distribution and use of the absorbent core. This led the way to much thinner products. More recent developments have included the addition of "wings" to the sides of products to facilitate the fixing of the pad in place in the undergarment. This assists in stopping bunching and preventing side leakage from the pad. This concept was further developed and extended into the development of "pantyliner" type products, which are not primarily intended for management of menstrual flow, but are designed to handle body fluids at any time. This allowed the products to be much smaller, thinner and more discreet while still fulfilling an important need.

Tampons

Although a modern product, the principle of an internally (inside the body) worn hygiene product is not new; their use is recorded over 2000 years ago when Egyptian women were known to have formed smooth papyrus into rolls to insert into their vagina to collect menstrual flow.

Industrially manufactured tampons were first introduced into the US market in 1936 and came to Europe in 1938. The market response was initially tentative due to concerns about the impact of tampons on virginity and sexuality. This was soon replaced by broad product acceptance as women began to experience the benefits of using tampons during their menstrual period for the increased freedom and flexibility they provided for participating in work, leisure and sporting activities. Since then, billions of tampons have been sold all over the world.

The principle function of tampons is to absorb the menstrual fluid intravaginally, after it has left the uterus, thus offering very discreet protection. In contrast to externally worn pads, tampons require a more detailed knowledge of the female anatomy. When inserted correctly in line with the in-pack instructions, the presence of the tampon is not felt, thus allowing all kinds of activities. They can be used, for example, for swimming during menstruation.

To meet the individual menstrual protection needs of women due to variances in menstrual bleeding patterns, tampons with different absorbent capacities are offered. Tampons come in different versions; either they are inserted with the finger (digital tampons) or with an insertion aid (applicator).

Incontinence Products

Absorbent products specifically designed for adult incontinence are the newest category of hygiene products. Their use in Europe began in the late 1960s. The design is based on the technology developed for baby diapers and feminine hygiene protection. The key performance requirements such as protection from leakage, comfort, discretion and skin dryness, are similar in kind but differ in degree according to the severity of incontinence.

Originally adult incontinence diapers were mostly used in nursing homes and hospitals where they brought considerable advantages to both patients and nursing staff. They provided increased comfort for the user, fewer skin irritations and infections, easier handling for staff, less washing, reduced odour problems and generally a more hygienic environment for the care of patients.

In recent years, however, the market for incontinence products outside institutions has grown considerably. Current growth rates in institutional markets are now smaller than in the home care environment where there is now much greater awareness of the benefits of incontinence products and much less stigma about their use than in earlier decades. They are an important tool in enabling people with incontinence problems to manage within their own homes rather than having to resort to nursing care. Products have become thinner, lighter and more efficient over the years and are available in a wide assortment of designs to fit varying needs.

4. Today's Absorbent Hygiene Products

All absorbent hygiene products are designed principally to contain body fluids such as urine or menstrual fluid. The ability to contain faeces is also an important attribute in baby diapers and some incontinence products.

Whilst individual absorbent hygiene product groups may have differing fit and use requirements, the basic fluid management structure follows similar principles in all categories. Fluid must be readily accepted, distributed and absorbed by the structure. Layered constructions and various materials are used to engineer these in-use performance requirements precisely. Materials selected must have appropriate properties and skin contact materials should be suitable for prolonged intimate use.

There are four principal functional layers, each of which is engineered to optimize overall product performance.

Topsheet or Facing

The layer next to the user's skin must be capable of allowing fluid to pass readily through to the next layer. It is important that fluid is not retained within the structure of this layer so that the amount of time that moisture is in contact with the skin is kept to the minimum. Softness of feel is a critical attribute for skin contact material.

Acquisition and Distribution Layer (ADL)

Fluid passes through the topsheet into the Acquisition and Distribution Layer where it is temporarily stored whilst capillary action causes it to spread over a larger area. This facilitates maximum utilisation of the absorbent core structure. As most Superabsorbent Polymers (SAP) can take a few moments to fully absorb fluid, the ADL plays an important role in managing fluid during this critical stage. Any absorbent hygiene product with a high superabsorbent and low fluff pulp content, such as a baby diaper, will place high demands on ADL performance. Products with high fluff pulp or low SAP levels can often function without a separate ADL due to the good capillary properties of the fluff fibres.

Absorbent Core

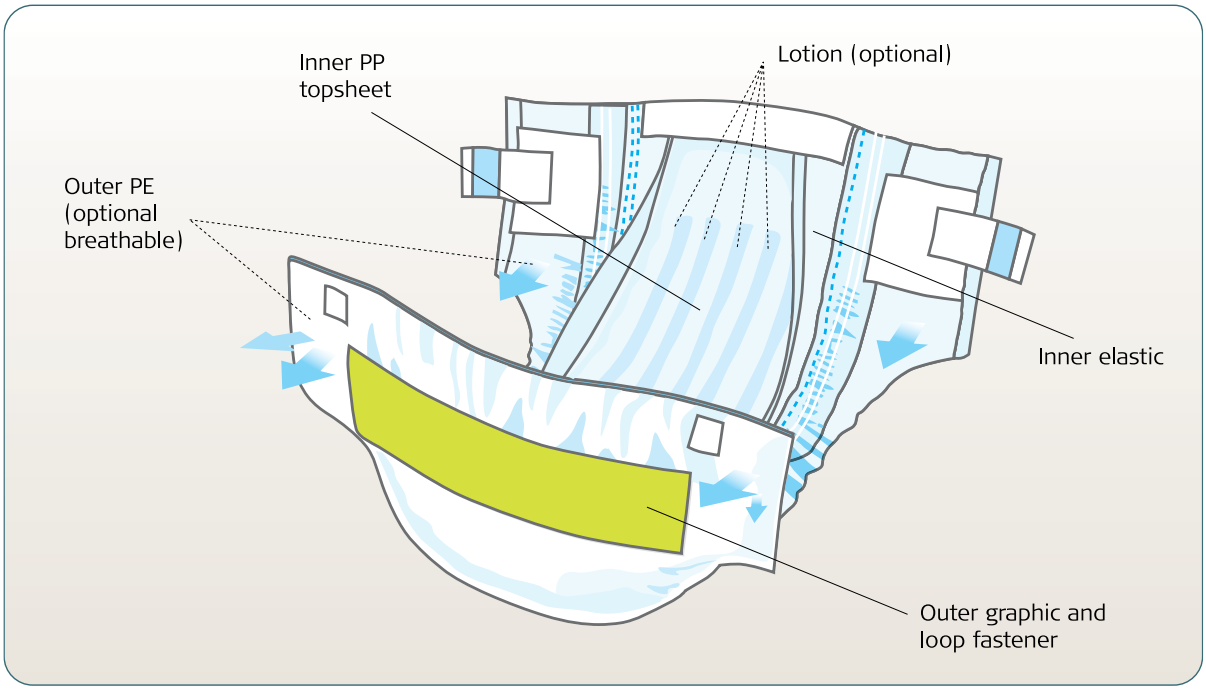
The fluid storage layer typically relies on an appropriate blend of fiberized fluff pulp and superabsorbent polymer to absorb and retain urine or menstrual fluids. Total capacity can be engineered to a level appropriate for any individual product application. Twin cores can also be used to manage high fluid levels in heavy incontinence products. Many modern 'ultra thin' feminine hygiene products use an engineered airlaid substrate as an absorbent layer. This is generally a pre-combined structure of multiple layers, containing both SAP and fluff pulp or other suitable capillary fibres. The resultant product is extremely thin and discreet in use.

The absorbent core in modern tampons is made of cellulose-based absorbent material, of either rayon (viscose) or cotton, or a mixture of both.

Backsheet or Outer Cover

The function of the backsheet is to provide a fluid impervious barrier so that moisture is contained within the structure of the absorbent hygiene product. Many types of films are suited to this application, most commonly used is low gauge polyethylene. Many products are subsequently enhanced by the addition of soft nonwoven covers to the polyethylene, which can be coloured or printed on to suit market needs. It is also generally accepted that a breathable film or nonwoven layer is of benefit in maintaining good skin condition, particularly in baby diapers and pantyliners. Polyethylene can be made breathable at the film extrusion stage by creating micropores in the substrate, and fibres in the nonwoven layer can be treated to be hydrophobic. These two processes allow air to pass through the film whilst maintaining an effective fluid barrier.

Figure 1 Schematic Overview of a Modern Disposable Diaper

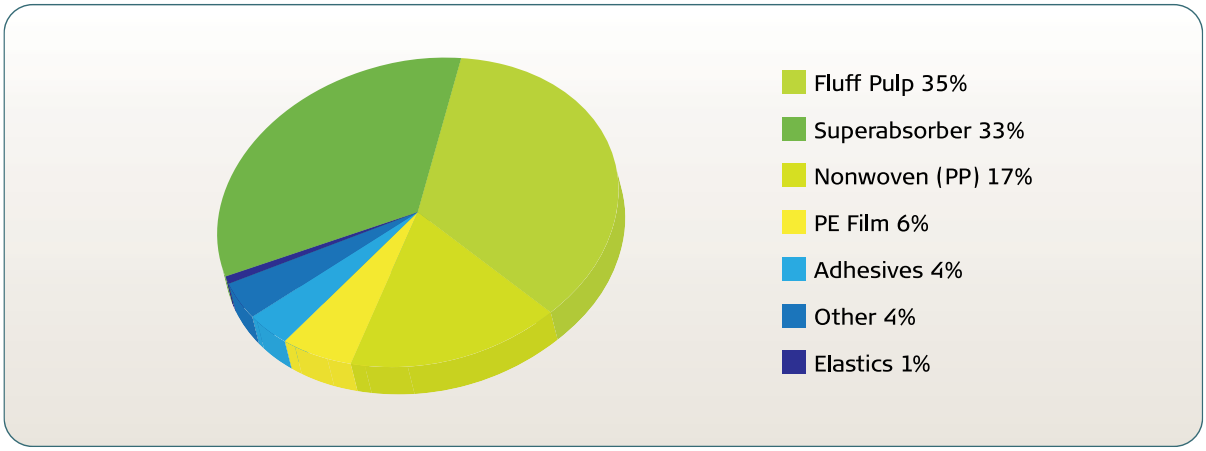


Baby Diapers (Figure 1)

Whilst the four principal functional layers of an absorbent hygiene product are the main components in baby diapers, other materials are necessary to aid ease of use for the parents and comfort for the child. Modern fastening systems are typically of a hook and loop style, elastic legs and inner cuffs are used to contain faeces, and several stretch features may be added to enhance the comfort of the child and fit of the diaper.

Diapers are made in a wide range of sizes and can fit babies up to 36 months old. There are also many supplementary product ranges available such as training pants and overnight pants to assist in the toilet training process as well as youth diapers for children with ongoing continence problems. A typical maxi-size baby diaper weighs approximately 40-42 grams. Over the last two decades diapers have evolved to become thinner, lighter, and more efficient. The 2006 average diaper composition, as measured through Life Cycle Assessment analysis, is given in graph 1:

Graph 1 Average Baby Diaper Composition 2006



Incontinence Products

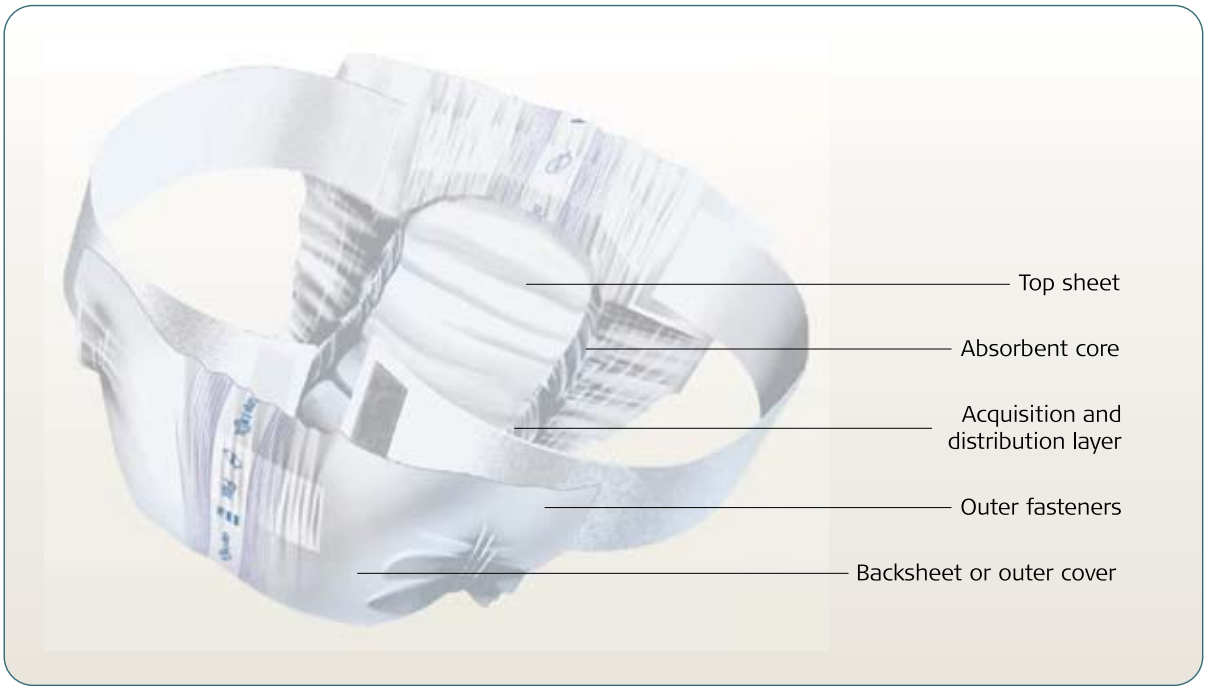
There is a wide range of products in this category to suit different people depending on lifestyle, type of condition and body size. All have common performance requirements, namely: dryness, leakage protection, comfort and discretion in use, reduction of odour and helping to prevent skin irritation.

For people with light to medium incontinence there are small pantyliners, pads and light pants; some are gender specific, while others are unisex. For people with medium to heavy incontinence problems there are heavy pants, two piece products (pad and pant), all-in-one briefs and belted briefs, (see figure 2). Whilst the four principal functional layers of an absorbent hygiene product are important in all incontinence products, other materials are necessary, depending on the type of product, to aid ease of use for the carer or nurse and for the comfort of the user; examples are belts, waist elastic, leakage barriers, tape or hook and loop fastening and elastic pants.

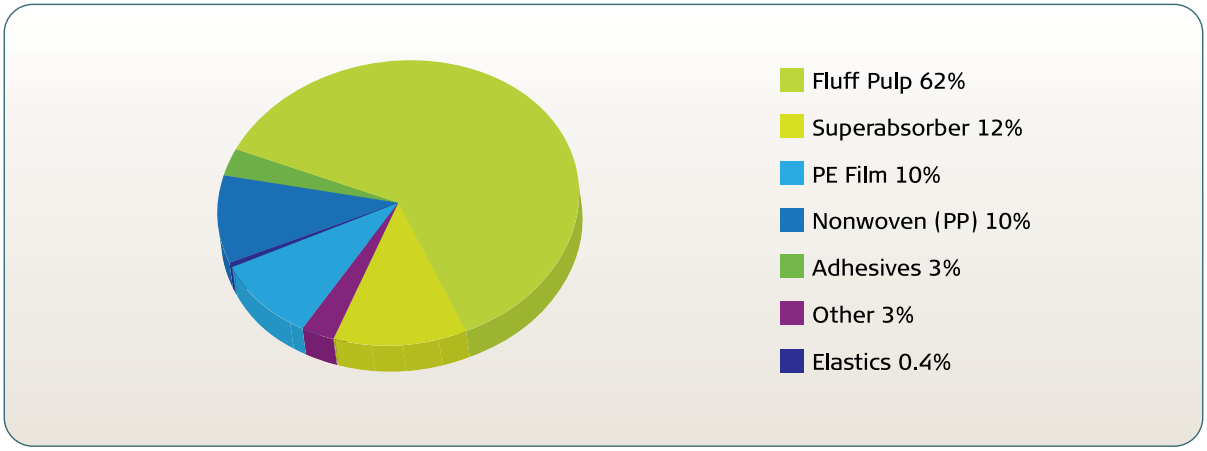
The product range manages everything from small drops of urine for an active younger woman to litres of fluid for a severely or double incontinent person in a nursing home. As a result the product weight ranges from a few to more than one hundred grams. It is therefore difficult to generalise about an "average product". Adult incontinence products typically use the same materials as baby diapers but in different proportions.

As with baby diapers, continuous innovation has meant that adult incontinence products have been able to become thinner, lighter, and more efficient over the years. The average composition for an all-in-one product is illustrated in graph 2:

Figure 2 Schematic View of a Belted Incontinence Product



Graph 2 Average All-in-one Incontinence Product Composition 2006



Feminine Care Products

Pads and Pantyliners

Feminine care pads are designed to absorb and retain menstrual fluid and other vaginal discharges and fluids. They come in various sizes for different levels of menstrual flow. They range from pantyliners, designed to absorb daily vaginal discharge and light menstrual flow, as a backup for tampon use or for small amounts of urine, to night pads - a longer product designed to provide more protection while the wearer is lying down, with higher absorbency which is more suitable for overnight use.

In addition to the four principal functional layers of an absorbent hygiene product, pads and pantyliners either have a removable sheet made from siliconized paper which protects the glue underneath the bottom layer or a siliconized polyethylene, which works as a single-wrap protection. The average composition for an ultrathin sanitary pad is illustrated in graph 3, while figures 3 and 4 provide a schematic view of an ultrathin sanitary pad and pantyliner.

Figure 3 Schematic View of an Ultrathin Sanitary Pad

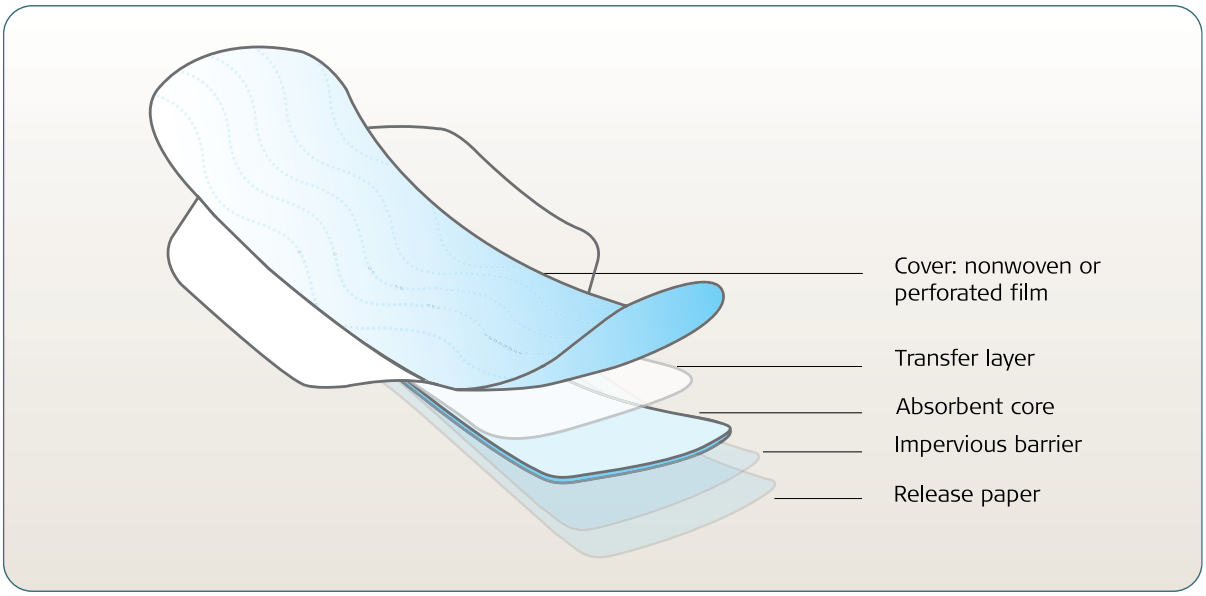
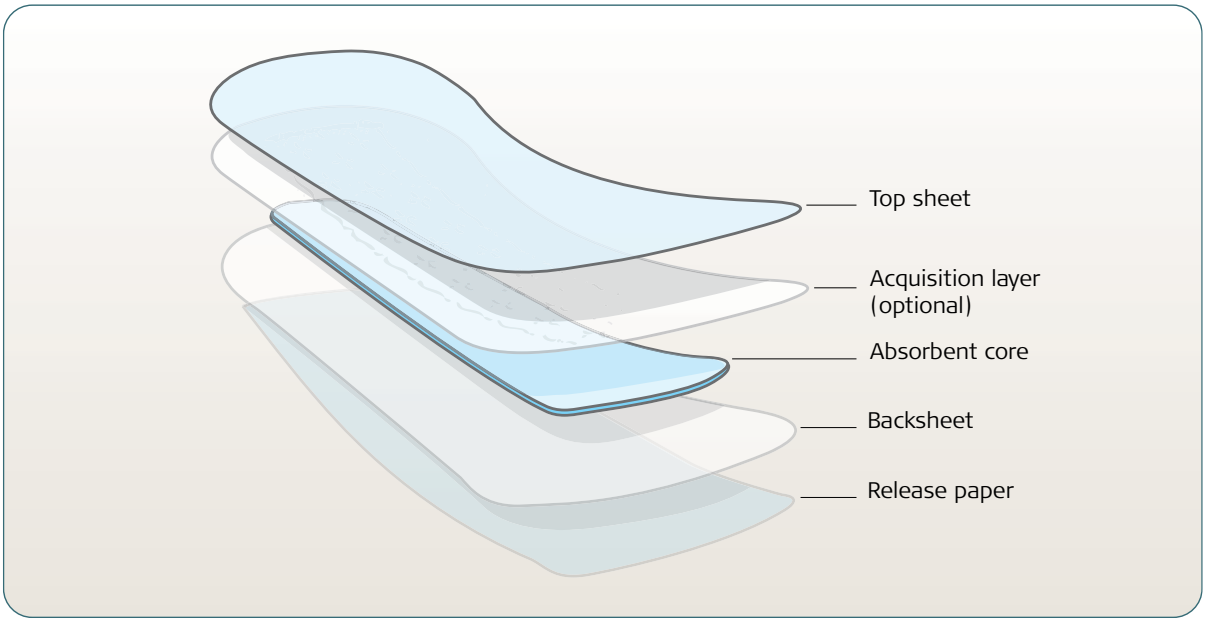
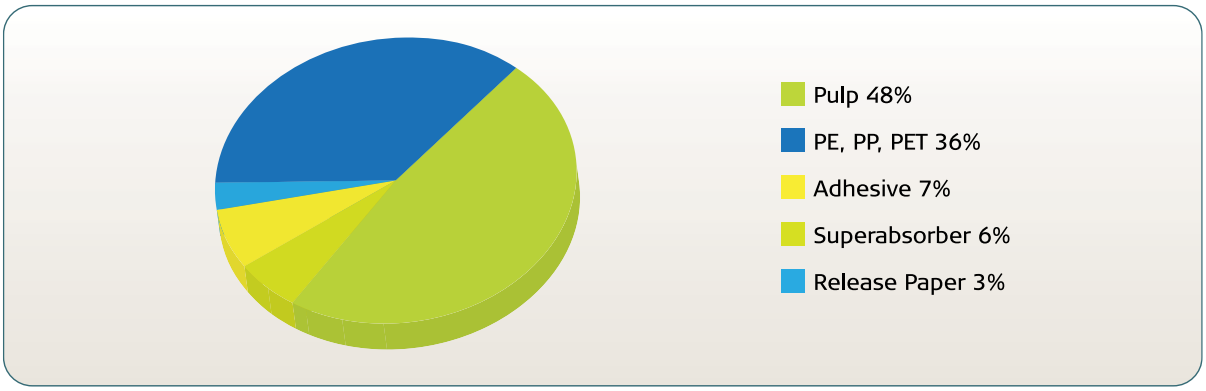


Figure 4 Schematic View of a Pantyliner



Graph 3 Average Ultrathin Sanitary Pad Composition 2006



Tampons

Modern tampons are mainly composed of cellulose based absorbent material such as rayon or cotton or a mixture of both. In most instances, the absorbent core is covered by a thin, smooth layer of nonwoven or other suitable material, making the tampon easy to insert and remove. The withdrawal cord used to remove the tampon can be made of cotton or polypropylene. The tampon is individually wrapped with a paper wrapper or a thin film before being packed into cartons.

Where an applicator is used it is made of either coated paper or polymers or a combination of both. Like other absorbent product categories they can be engineered by size and absorbent capacity, (see figures 5 and 6).

Figure 5 Schematic View of an Applicator (Insertion Aid) Tampon

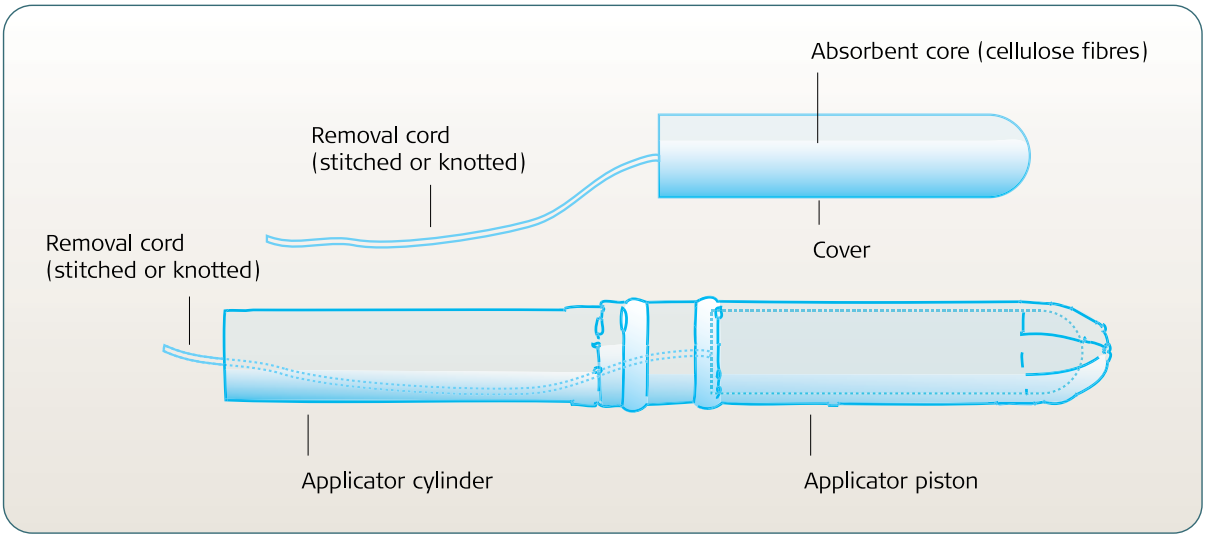
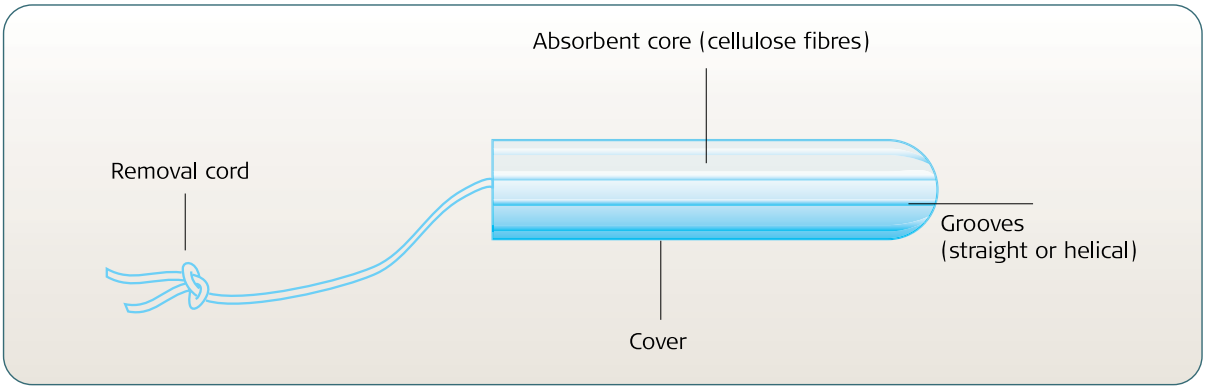


Figure 6 Schematic View of a Non-Applicator (Digital) Tampon



Social Aspects of Sustainability

5. The Social Contribution

"Today's absorbent hygiene products offer a level of sophistication, comfort and discretion that is taken for granted by millions of people throughout the world."

Lifestyle & Convenience

Absorbent hygiene products have become an indispensable feature of modern day living for all generations. Whether it is as users or carers, men and women around the world rely on absorbent hygiene products for convenience, comfort, discretion and hygiene.

Baby Diapers

Modern disposable baby diapers have made an important contribution to the quality of life of millions of people. Pervasive in their availability and acceptance, they provide convenience, comfort and skin care benefits. In fact, in a survey carried out by the Louis Harris Research organization in 1997, respondents with children identified disposable diapers as the second greatest improvement in contemporary life (the first being the automatic washing machine), compared with the generation that went before them.

Since their introduction, modern single-use diaper products have improved steadily through scientific advances in design and basic raw materials, becoming lighter, more compact, more absorbent and easier to use. Originally they were promoted for use on journeys, holidays and in temporary situations but it was not long before parents realized how practical and convenient they were for everyday use. Today it is estimated that more than 95 percent of all parents in advanced economies use them – and it is generally recognized that:

- modern disposable diapers are healthy for the infant's skin because their usage results in reduced skin rash incidences, skin irritation and infections;
- their softness, lightness and the breathable nature of some of the raw materials provide for superior comfort for the baby;
- they are easy to put on and remove, taking up less time than, for example, using cloth diapers;
- they are convenient because they eliminate the need for constant laundering at high temperatures (≥ 65 °C for not less than 10 min; or ≥ 71 °C for not less than 3 min, according to the BSI's Publicly Available Specification) to kill germs, and drying.

In some countries in Europe local governments have recently experimented with encouraging parents to use cloth diapers. In Belgium for example, in 2002 the Flemish Administration on Waste, OVAM, launched a project designed to encourage the use of reusable diapers. Mothers in a maternity ward in a hospital in Leuven were invited to participate in a pilot programme using reusable diapers for a period of 13 weeks. The project was repeated in 2005 and a report was produced on the project by Deloitte Business Advisory in April 2006. The report showed that:

- it was difficult to get women to agree to participate in the pilot in the first place; 70 percent of the 436 women invited to participate in either phase of the pilot declined;
- of those that did agree to participate in either the 2002 or 2005 phase, only 23 women, that is five percent of the total number of women invited to participate in the pilot, said they intended to continue using reusable diapers at the end of the 13 weeks.

Disposable baby diapers have become the method of choice for nearly all families across Europe. There can be little doubt that the convenience of disposable diapers is a huge benefit in today's busy lifestyles where time is a precious asset. They lessen the burden of domestic chores freeing parents to spend more time on other activities in their family, social or economic lives.

Incontinence Products

Urinary incontinence is a common condition and affects both men and women in different life stages. More than 25 percent of women have experienced incontinence at some time in their life. Around 10 percent have regular problems and the number increases with age. One main reason for female incontinence is the weakening of the pelvic floor muscles which can occur due to pregnancy and childbirth. Around 4 percent of men experience daily urinary incontinence and the figures rise to 17 percent among elder men. Risk factors for men are infections, prostatectomy (removal of the prostate) and age itself (there is a greater increase in the prevalence of incontinence in ageing men than there is in ageing women). In later years of life incontinence can be caused in both men and women by other conditions such as stroke or senile dementia.

The International Continence Society (ICS) defines urinary incontinence as any involuntary leakage of urine. There are different types of incontinence such as stress, urge and mixed urinary incontinence as well as faecal incontinence (also called bowel incontinence or anal incontinence), that affect people of all ages.

All forms of incontinence can cause isolation, depression and physiological problems and can significantly impact on social and work related aspects of the sufferer's life. In addition, incontinence can be a heavy burden for family caregivers and the community. It is often a major contributing factor in deciding that aging parents are no longer able to live independently and need a level of care that can only be provided in residential care or nursing homes.

A wide range of products is available to suit varying degrees of incontinence, disability and lifestyle. Light and medium incontinence products are sold in drugstores, supermarkets or pharmacies. Heavy incontinence products are mainly used in residential homes or nursing care environments.

Adult incontinence products have a significant positive impact on the quality of life of individuals suffering from incontinence. These products, by offering security, comfort, discretion and odour control, enable users to maintain their sense of dignity and engender the confidence that allows them to leave their homes, work, take part in social activities and lead a full and satisfying life.

The benefits adult incontinence products bring to the health care sector are also considerable. They:

- help in infection control and minimise the spread of infection between patients;
- save valuable care assistant time in changing and disposing of products allowing more time for other important caring activities;
- save costs in reducing the need for care of infections and bed sores caused by wetness and leakage;
- save costs and time in washing soiled clothes and bed linen.

It is estimated that 55 percent of female residents in long term care facilities in Europe are incontinent.

The importance of these products and their economic benefits in addressing the problems created by incontinence is recognized by the fact that in many countries incontinence products are available on prescription from medical professionals and the costs are consequently reimbursed either through health authorities or health care insurers.

Feminine Care Products

Throughout their adolescent and adult lives women must manage both regular and intermittent loss of menses and other fluids. During the reproductive years menstrual bleeding can be regular, intermittent, heavy or light. Modern feminine care products provide protection regardless of the circumstances. The variety of products now available, and their comfort and size, means that today's generations of girls and women experience much less inconvenience, disruption and embarrassment as a result of menstruation and are able to live active and unfettered lives regardless of their reproductive cycle.

Menstruation or periods start during puberty (typically 10 to 16 years of age) and continue until the menopause (typically 45 to 55 years of age). The average menstrual cycle lasts 28 days, but commonly varies between 24 days and 35 days. After puberty, most women develop a regular menstrual cycle with a relatively consistent length of time between periods. Menstrual bleeding normally lasts between two and seven days, with the average period being five days. However, some women experience an irregular menstrual cycle with wide variations in the interval between periods, the amount of menstrual fluid lost and the duration of bleeding. One out of three women describes their periods as heavy.

Over the centuries menstruation has attracted, and continues today to attract taboos; their characteristics vary between cultures and range from taboos concerned with contamination of sacred places by menstruating women, to those based primarily on the social acceptability of either discussing or demonstrating evidence of menstruation in public. Even in more liberal societies many men and women are still embarrassed by the subject. Product advertising over recent decades has helped to bring the subject of menstruation into the mainstream and company consumer affairs departments, internet pages and chat lines about menstruation have provided ready access for girls and women to information and advice.

Modern absorbent feminine care products have significantly contributed to increased confidence for women regardless of whether they choose pads or tampons.

Product improvements in pads and pantyliners over the years have meant that they:

- are much thinner and therefore provide increased comfort, flexibility and discretion;
- are more absorbent and better fitting thus reducing the risk of leakage;
- draw menstrual flow from the top layer into the absorbent core resulting in a much drier feel for the user;
- contribute to odour control.

With the introduction of tampons, women had for the first time, the option of choosing a product that, by its inherent design, offered the utmost in discretion and freedom during menstruation. In addition, tampon usage may encourage young girls and women to understand their bodies better. A tampon is neither felt during wearing nor does it restrict movement or hinder a woman from engaging in any sporting or leisure activities (including swimming), putting an end to the limitations previously imposed on women by their reproductive cycle.

Improvements in the performance and comfort of absorbent hygiene feminine care products have led to significant benefits to the individual user and to society as a whole, not least through less lost time from work or study as a result of menstruation and increased mobility during the menstruation period.

Skin Health Benefits

Societal value is also derived from the reduction in excessive skin wetness which modern absorbent hygiene products provide. This has led to a consequent reduction in associated skin irritations which in the past often necessitated some form of medical intervention.

Diaper dermatitis (diaper rash), or incontinence-associated dermatitis, is a non-specific term used to describe a wide range of inflammatory reactions of the skin in those areas of the body covered by diapers. Secondary superinfections with *Candida albicans* (yeast infection) are also common when the skin in the diaper area has been compromised by diaper rash. Diaper dermatitis affects both the young and the old, typically when the skin is vulnerable.

Diaper dermatitis is related to excessive skin wetness. Reference to it is found in the medical literature as early as 1877 (see References: Skin Health Improvements, p 65-67). Published clinical and laboratory studies have shown that increased skin wetness, higher skin pH and the mixing of urine with faeces all increase the risk of developing diaper rash. Enzymes in the faeces can attack the skin, especially if it is already compromised by hydration. Ureases, also contained in the faeces, can convert urea in the urine to ammonia, which further increases the pH and enhances the activity of the lipases and proteases enzymes.

It is generally recognized that diaper dermatitis:

- is experienced by almost every child of diaper wearing age – it is estimated that one quarter of all babies experience diaper rash in their first four weeks of life when the body has yet to develop its resistance to infection;
- comprises a series of more or less severe inflammatory reactions in the skin covered by diapers;
- is frequently associated with *Candida albicans* superinfection requiring medical intervention;
- is primarily caused by irritants in the urine and faeces.

Figure 7 illustrates the activating factors and scientific causes of diaper dermatitis and the interventions that can be taken to reduce its incidence.

Over the last twenty years baby diaper and incontinence product technology has advanced considerably in the following ways:

- the introduction of Superabsorbent Polymers (SAP) has created an improved core structure. SAPs are capable of absorbing many times their own weight in liquid. They help to hold the urine away from the skin and faecal enzymes. Comprehensive scientific safety testing on these materials, together with a long and successful history of use, has assured that they are non-irritating and non-allergenic, and safe for consumers;

- innovative top sheet material through which urine quickly penetrates. This provides increased efficiency in the transfer of liquid as well as creating a barrier between the moisture and the surface of the skin. The top sheet has also been made softer and its weight has been reduced over time;

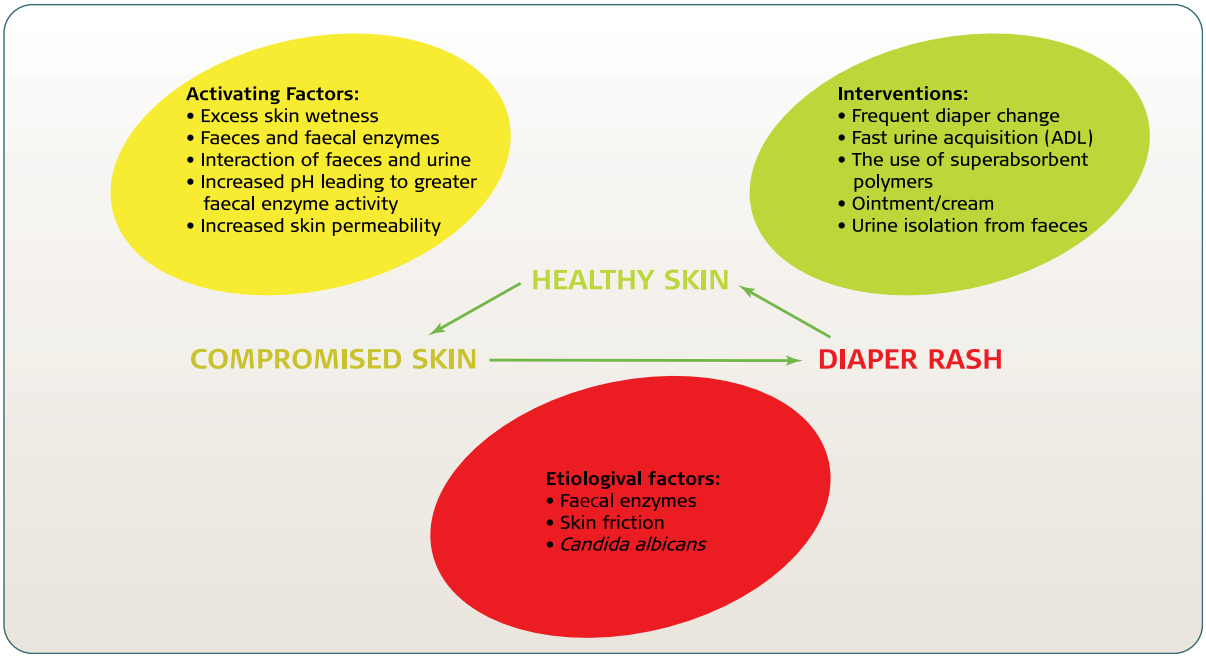
- breathable, microporous outer covers which keep the skin drier and have been shown to have a positive impact on the skin condition in the diapered area, particularly in terms of occlusion (closure or blockage), diaper dermatitis and *Candida albicans* superinfections.

The scientific evidence that these innovations have produced real benefits in skin care, dryness, and leakage protection is well established (see References, Skin Health Improvements p 65-67). Clinical studies have demonstrated the ability of disposable diapers based on SAP technology to keep the skin drier and that a more stable skin pH with less dermatitis is achieved with disposable diapers than with home-laundered cloth diapers. In addition the isolation of urine from faecal material in diapers facilitated by the SAP helps minimize the formation of ammonia from urea. SAP technology has also been tested in other clinical studies, using infants with atopic dermatitis (naturally dry and sensitive skin) and in children in day care, to further verify its compatibility with these conditions and the skin care benefits.

Babies wearing highly breathable disposable diapers have also been shown to experience significantly less diaper dermatitis compared with infants wearing non-breathable diapers in a series of double-blind clinical studies. Severe diaper dermatitis, including confirmed infection with *Candida albicans*, was reduced by up to 50 percent in the groups of children wearing breathable diapers, (see graph 4). Controlled microbiological evaluation confirmed the inhibitory effect of breathable diapers containing superabsorbent polymers on the survival of *Candida*.

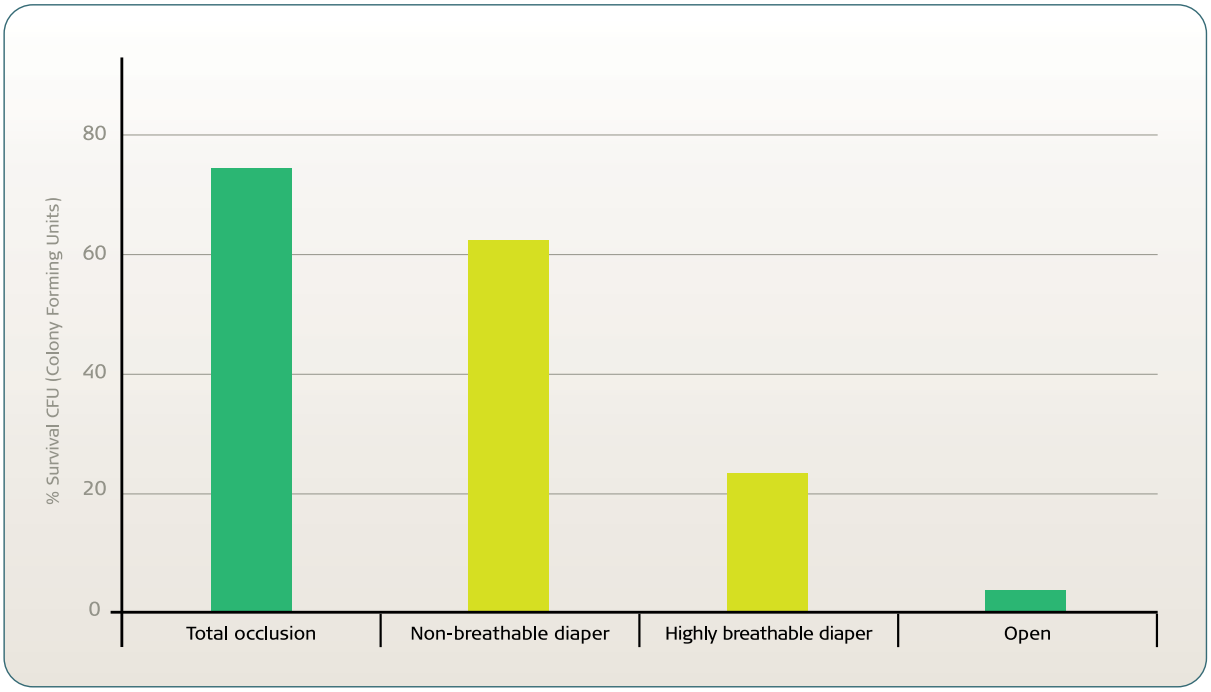
It is the view of many paediatricians and nurses that the number of infants seen with diaper dermatitis is declining over time, (see graph 5). Indeed, a review of clinical studies conducted over the past 15 years in the US and Western Europe with over 6500 babies supports the view that the diapered skin condition of the baby population has improved over the years. Since socio-economic conditions did not change substantially over these years in the regions in which the clinical studies were conducted, it appears that better disposable

Figure 7 The Diaper Dermatitis Model



Graph 4

Survival of *Candida albicans* on Human Skin under Breathable and Non-Breathable Disposable Diapers

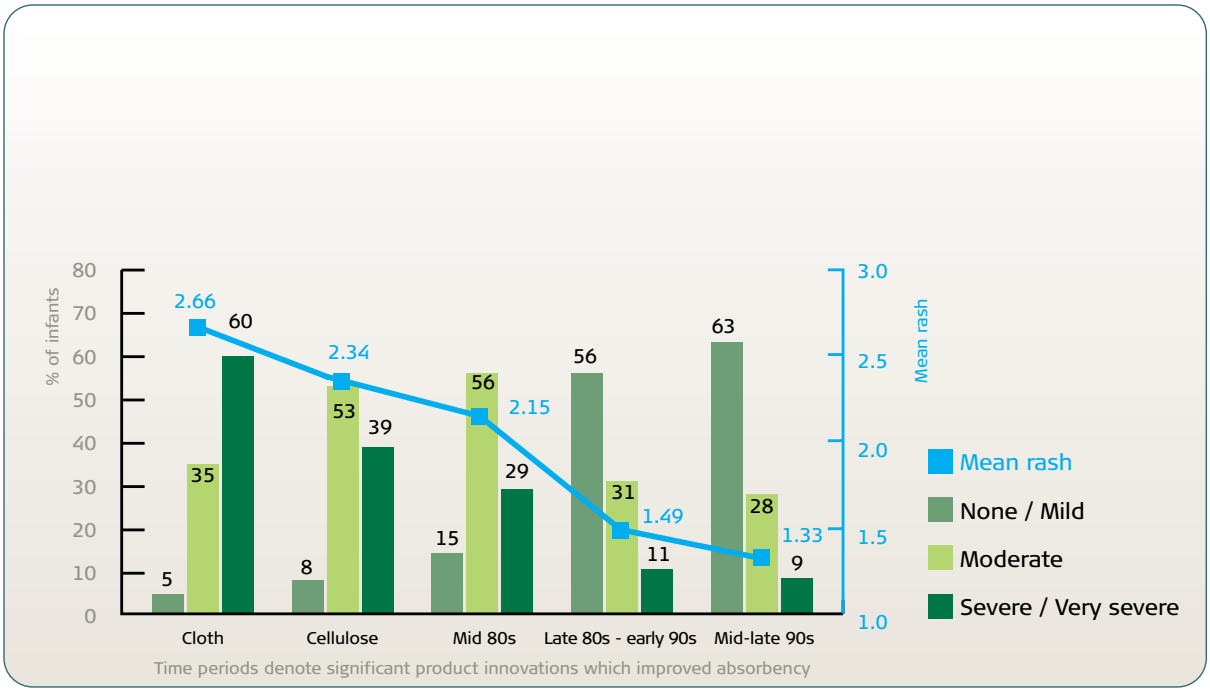


diaper technologies have played a key role in the improvement of the skin condition of diapered infants, in particular in the large decrease in severe diaper rash cases reported.

For incontinent people a holistic approach of using modern absorbent hygiene products in combination with appropriate skin care and cleansing routines and products can eliminate dermatitis and maintain good skin health.

Graph 5

Product Innovation and Diaper Rash Reduction



“ Whether it is as users or carers, woman of all ages around the world rely on absorbent hygiene products for convenience, comfort, discretion and hygiene. ”

6. Industry's Social Responsibility

Product Safety

The principle that our products must be safe for consumers, employees, and the environment, is paramount within our industry. It guides us in raw material selection, product design, manufacturing, consumer communications and considerations relevant to the disposal of our products.

In order to ensure the safety of the product:

- raw materials are rigorously evaluated, often with the help of specialized laboratories for toxicological evaluation, skin compatibility (ability to induce allergy/irritation), stability and ageing tests;
- during product design, product integrity tests are undertaken to simulate in-use conditions;
- finished products undergo inspection for absence of contamination and microbiological safety is ensured by quality assurance systems;
- manufacturers also carry out in-use testing to ensure dermatological compatibility.

In addition to our industry's own commitment, we must also comply with all appropriate legislation, technical standards, regulatory prescriptions and safety guidelines. European Union legislation provides the legal framework of manufacturers' obligations in this respect (for example, Directive 92/59/EEC & 2001/95/EC on General Product Safety) and is implemented at member state level. This legislation pertains to all absorbent hygiene products. There are other regulatory provisions which apply to some other categories of products:

- adult incontinence hygiene products are classified as Class I medical devices by the European Medical Device Directive 93/42/EEC. In order to comply with the European Medical Device Directive there are specific ISO/CEN technical standards requirements for biological safety testing (the IS0 10993 series) which should be followed;
- some absorbent hygiene products may contain components which can fall under a specific directive with its own regulatory and safety requirements; for example, the lotion part of diapers has to comply with the European Cosmetic Directive 76/768/EEC and its amendments;
- in addition to EU wide regulations, national rules need to be observed in some countries, an example being the German Food and Feed Act (LFGB).

The new European law on chemicals, REACH (Registration, Evaluation, Authorisation and Restriction of Chemicals), entered into force on 1 June 2007. Manufacturers of absorbent hygiene products and their supplier members of EDANA, have thoroughly prepared themselves for the implementation of REACH working together to ensure a shared understanding of, and compliance with, their respective obligations under this new legislation.

Our industry does more than simply comply with the legal framework to ensure that our products are safe. In addition to our safety evaluation programmes, individual companies continuously monitor their products in use and any concerns consumers may have in using them. It is not unusual, for major product changes or on the launch of new products, for independent experts to be consulted to ensure that all aspects of safety are considered and where appropriate, clinical tests may be performed.

In addition, manufacturers of absorbent hygiene products have systems in place to:

- receive communications from consumers – usually using free phone numbers featured on product packages;
- receive, investigate and take appropriate actions in response to consumer complaints;
- answer enquiries from consumers and other stakeholders;
- recall their products from the market in the event of a serious product quality or safety issue.

The industry has also undertaken a number of voluntary initiatives within its overall commitment to safety.

The Tampon Code of Practice

This code was introduced in 2000 as a voluntary initiative by the industry to ensure that there is harmonization of important information provided to users of tampons irrespective of the brand used. This harmonization relates to:

- the need for clear advice and guidance on the correct use of tampons;
- consistency in the presentation of certain information;
- consistency in labelling of packs of tampons with regards to the absorbency of the product using a droplet system to denote levels of absorbency;
- on-pack notification about menstrual Toxic Shock Syndrome (TSS) and the inclusion of a leaflet with important information on how to use tampons properly and about TSS within the pack.

The Code has the endorsement of the European Commission which has encouraged national governments to adopt it as well.

The Toxic Shock Syndrome Information Service (TSSIS)

The TSSIS was launched in the UK in June 1993 to provide members of the public and medical professionals with factual and balanced advice on both menstrual and non-menstrual Toxic Shock Syndrome. It is funded and supported by the major manufacturers and distributors of tampons in the UK. By the end of 2005 some 3 million information leaflets had been distributed to schools, colleges, professional and medical associations, pharmacies and other relevant institutions such as prisons.

The TSSIS is advised by a panel of medical experts who oversee and endorse all its activities and literature. Panel members are drawn from a range of disciplines, including general practice and primary care on a community level and from hospital consultants in the areas of gynaecology, paediatrics and accident and emergency. These panel members represent the front line of clinicians who could potentially encounter a case of TSS and therefore appreciate the problems faced in correctly diagnosing the illness

The main consumer-focused activities of the TSSIS include:

- personalized responses to individual enquiries;
- distribution of information to the general public and third party informers through groups such as the National Union of Students;
- presentations to the general public, for example the Women's Health and Screening Delegation;
- training of third party groups such as members of St John's Ambulance.

Exposure Based Risk Assessment (EBRA)

Risk Assessment is a critical component of ensuring product safety. The presence of a substance in an absorbent hygiene product does not in itself provide information about the safety profile of the product. The biological potency of the substance and the exposure resulting from typical product use needs to be taken into account for an assessment of risk. To enable a robust risk assessment, exposure parameters must be taken into account. This process can occur using the Exposure Based Risk Assessment (EBRA) concept.

Absorbent hygiene product manufacturers have collaborated on a detailed and voluntary case study of applying EBRA principles to baby diapers. It was presented and discussed with independent international scientists in a poster session at the International Conference on Environmental Epidemiology and Exposure held in Paris in September 2006.

In summary, absorbent hygiene products have an extremely good safety record:

- they have been proven to be safe for their intended use and have a history of safe use by millions of people worldwide over many decades;
- the materials used in them also have a long history of safe use in many other product applications in society. So, for example, polymeric materials are also used in food wrap/containers and medical devices including absorbent gauze and surgical dressings. All of these materials have proven safety profiles;
- our industry continues to collaborate on voluntary initiatives over and above those required by legislation to assure the safety of our products.

“As an industry we believe it is our role to promote awareness and increase understanding of the benefits and sustainability of absorbent hygiene products.”

Corporate Social Responsibility

The manufacturers of absorbent hygiene products recognize their responsibility for operating in a responsible manner in all aspects of their business. While each company approaches these responsibilities in their own way reflecting their individual values and cultures, we strive to ensure that as an industry we:

- respect, comply and often exceed the requirements of the law and regulations wherever we do business;
- respect human rights as they relate to our own employees and to broader issues such as child labour and worker exploitation;
- operate our facilities with due care and consideration to the health and safety of the people within them;
- encourage diversity, equal opportunities and the development of human potential within our employee base;
- deal fairly with our suppliers;
- demonstrate active management of environmental stewardship.

As an industry we also believe it is our role to promote awareness of and increase understanding of the benefits and sustainability of absorbent hygiene products amongst a wide range of stakeholders. Working together in 2007 and 2008 we plan to do this in a managed programme which will include:

- undertaking a societal study of the contributions absorbent hygiene products make to modern life;
- creating more fact-based public information on relevant subjects which will be available to our stakeholders via web pages as well as in printed form;
- holding roundtable discussions with stakeholders on subjects of common interest;
- working with independent experts who can advise us on these issues and help to ensure that issues are understood by our stakeholders.

We recognize too that we do not conduct our business in a vacuum; that we live and work within communities. Our member companies make many contributions to the communities where they operate. Some examples of the types of programmes supported are activities that:

- give children a good start in life;
- address infant health issues;
- address issues of incontinence and bed wetting;
- support the development of better child care facilities;
- provide support for patient groups;
- provide factual information about incontinence, menstruation and baby care;
- promote good incontinence care for older people;
- create partnerships on environmental initiatives;
- support local environmental and regeneration improvements;
- facilitate employee involvement in local community activities.

Some of our member companies produce their own individual sustainability reports; further information on specific company initiatives is available in these reports or on company websites.

Environmental Aspects of Sustainability

7. Environmental Stewardship

Life Cycle Assessment

Life Cycle Assessment (LCA) represents the best available method for understanding the holistic environmental performance of products and services. It is not the only method for managing environmental performance, but it is the method that gives the most comprehensive picture and it is broadly recognized by authorities, regulatory bodies, consumer organizations and other relevant stakeholders. In the LCA approach the product is viewed in its totality from its "cradle" to its "grave", that is from harvesting the natural resources to the ultimate disposal of the product after use and a broad range of environmental impact categories are taken into account, (see figure 8). This ensures that all aspects of a product's environmental performance can be analyzed and assessed and ensures that problems are not shifted from one stage of the life cycle to another or from one environmental impact category to another. LCA has provided absorbent hygiene product manufacturers with a rigorous and credible method for understanding the potential environmental impact of their products and processes and helps to provide a framework for future improvements. EDANA fully supports the international standards of LCA (the ISO 14040-series) and considers it is important that these international standards be followed when LCA is used for external purposes.

LCAs can be used to understand the differing environmental impacts of the same category of products over a specified time period (trend analysis studies) as well as being used to compare the environmental impacts of different types of products at the same time (comparative studies).

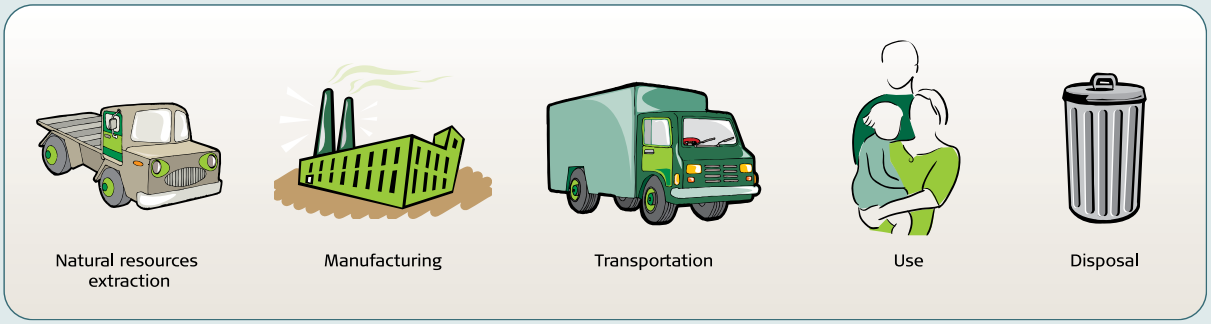
Trend Analysis LCA Studies of Absorbent Hygiene Products

EDANA has commissioned three major trend analysis LCA studies: one covering baby diapers from 1993 – 1995, one covering incontinence products from 2001 – 2003, and most recently in 2005. This latest LCA project was undertaken on EDANA's behalf by an independent German research institute, the Institut für Energie und Umweltforschung (IFEU). It is a trend analysis to determine the improvement in overall environmental impact as a result of changes in product design, materials selection and production processes for both baby diapers and incontinence products.

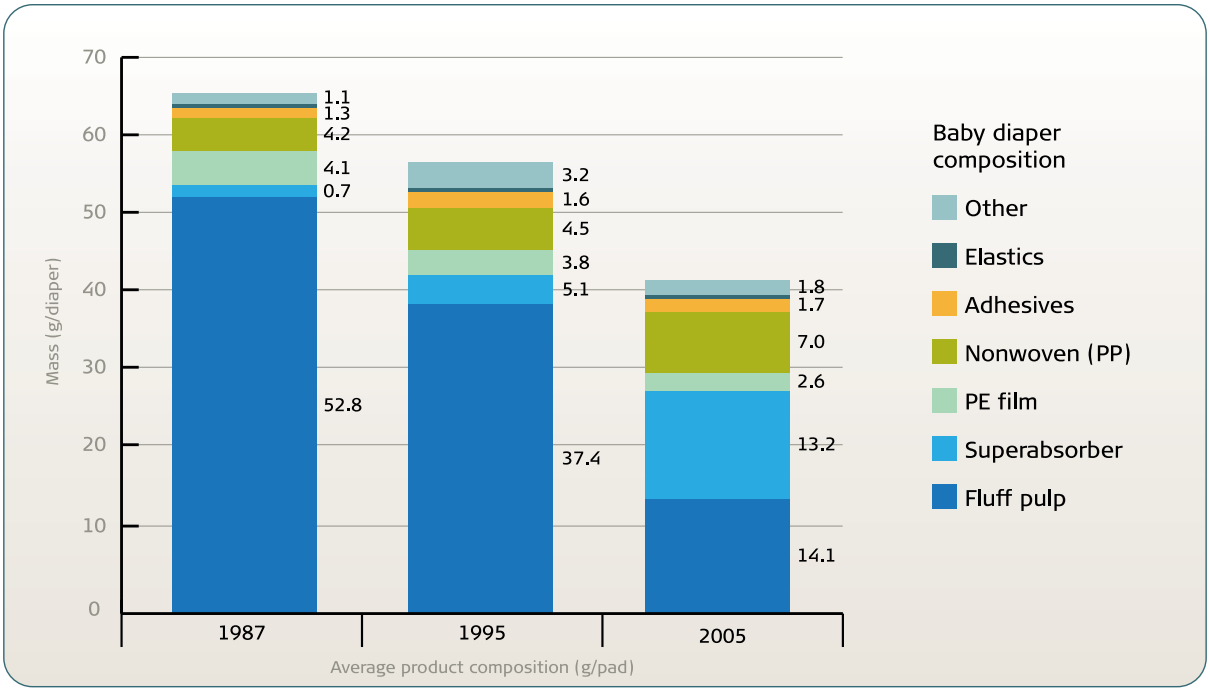
Disposable Baby Diapers

Product innovation such as the introduction of superabsorbents not only delivered significant diaper performance improvements but also resulted in measurable improvements in the environmental profile of baby diapers. As a result of such developments, the average diaper weight has been significantly reduced by almost 40 percent in a period of 17 years, from around 65 grams in 1987 to 56 grams in 1995 and to 41 grams in 2005. In addition significant advances have been made in packaging, truck loading and transport efficiency which have all contributed to achieving improved environmental performance.

Figure 8 Life Cycle Assessment Stages - From Raw Material Extraction to Disposal



Graph 6 Baby Diaper Weight Reduction and Change in Composition 1987-2005



In baby diapers for example, the weight of packing has been reduced by 41 percent from 8.0 kilograms per 1000 pieces in 1987 to 4.7 kilograms per 1000 pieces in 2005.

Using the Life Cycle Assessment (LCA) method the impact of weight reduction and of product composition changes on the environmental profile of diapers has been examined along the entire product life cycle. The functional unit chosen to compare the trends was the diapering period of one child, estimated to be equivalent to 3796 diapers. In the Life Cycle Inventory phase a large number of parameters were investigated. Their combined potential impact on the environment was then evaluated in a Life Cycle Impact Assessment. In addition to publicly available databases on aspects such as energy production and transport, much of the data used is industry specific and has been collected and collated through EDANA. These data sets reflect the development of relevant processes over a period of time rather than data for a specific year only, as well as the different regions in which the processes took place.

Life Cycle Impact Assessment

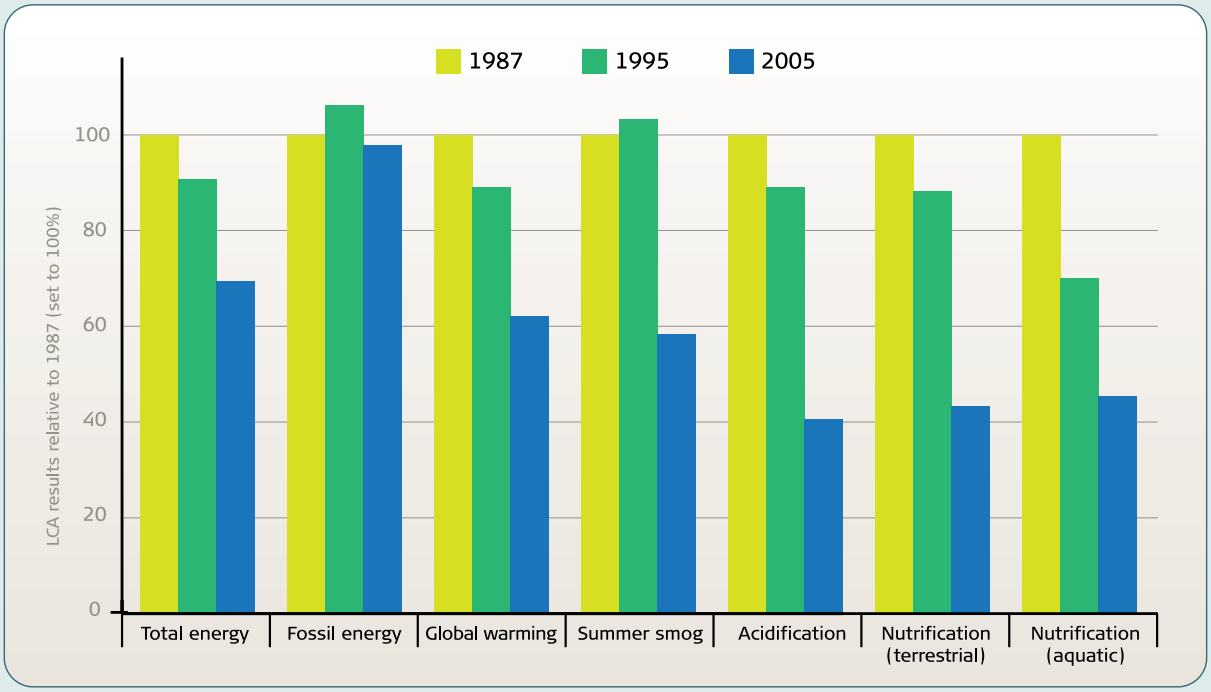
Apart from the energy demand, the following relevant impact categories were selected:

- global warming potential;
- photochemical ozone formation potential;
- acidification potential;
- nutrification potential (terrestrial and aquatic).

Graph 7 provides an overview of the trends for the major environmental indicators. It demonstrates the overall improvement which has been achieved between 1987 and 2005. These improvements can be attributed to a combination of improved processes (including waste management) and changes in diaper composition. For some categories a reduction of more than 50 percent is observed.

The graph also shows limited increases from 1987 to 1995 for fossil fuel energy consumption and summer smog. These slight increases are because the weight reduction that took place between 1987 and 1995 was offset by changes in product composition with some materials using slightly more fossil fuel energy and generating slightly greater emissions contributing to summer smog. It is important to note however that it was necessary, due to the absence of 1987 process data, to use 1995 process data to calculate the environmental impact of a 1987 diaper. The 1995 process data is better than the 1987 data would have been; it is reasonable to assume therefore that the real values in 1987 would have been higher and the improvements made in 1995 and 2005 against 1987 are underestimated.

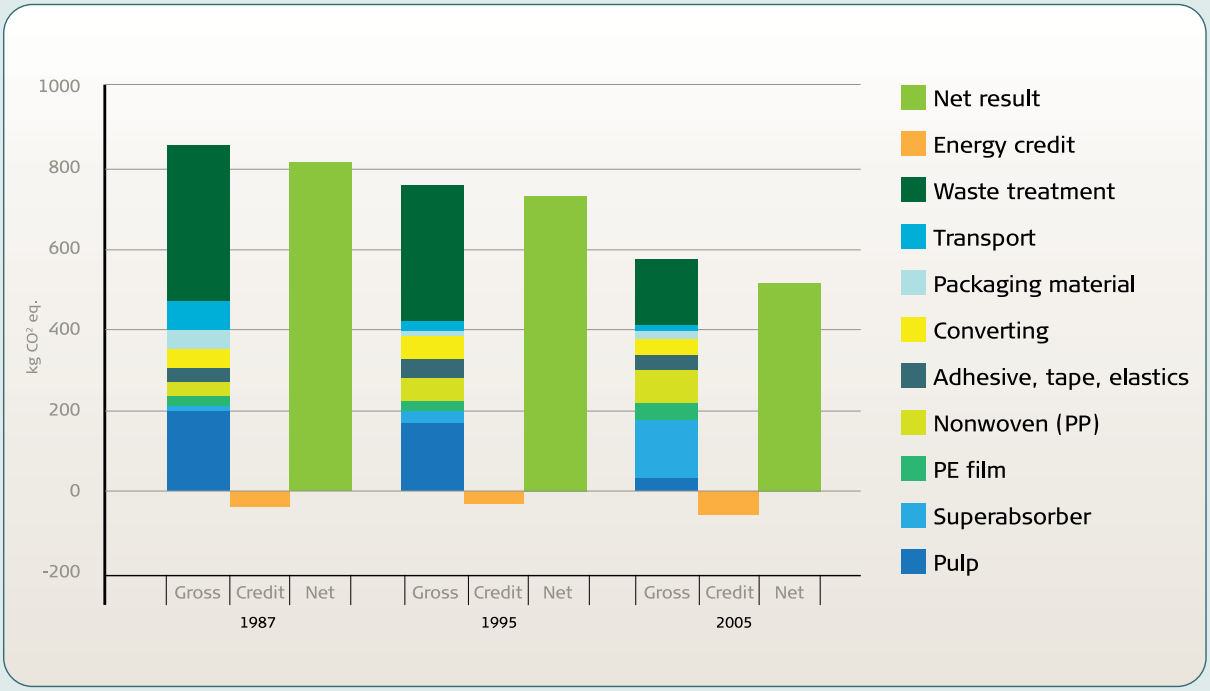
Graph 7 Trends for Major Environmental Categories for Baby Diapers 1987–2005



The LCA data means it is also possible to see specifically where the reductions are generated. Graph 8 provides an example for the impact category of global warming. The graph shows the overall impact on global warming segmented by the constituent parts of the functional unit in 1995 and 2005. The gross column shows the impact of each material or process. Credits come from energy recovery processes such as thermal water treatment which generate power. The net column is therefore the overall impact. Although the contributions from some ingredients went up due to their higher share in the diaper composition, the overall trend shows positive improvement.

Overall, the changes made to the composition of diapers and the consequent reduction in pulp usage has led to significant weight reduction since 1987. This in turn has led to considerable reductions in environmental impact. Product innovation during the last two decades therefore not only improved product performance of disposable diapers, but went hand in hand with significant environmental improvements in many areas.

Graph 8 Improvements in Global Warming Impacts for Baby Diapers 1987 - 2005



Incontinence Products

The first LCA commissioned by EDANA on incontinence products was produced in 2004 and was a Life Cycle Inventory of an all-in-one adult incontinence product. In the report a comparison was also made of a product from 1995 with one from 2002. In EDANA's LCA Trend Analysis of 2005, this comparison was updated using a 2005 product specification. It is important to note:

- for these products, unlike baby diapers, it is not possible to estimate the duration of the incontinence condition and therefore the associated period of product use. Therefore, for the purpose of this analysis the functional unit, which is the unit upon which all calculations are based, was set to 1,000 incontinence products for both years;

- the all-in-one product is designed for heavy incontinence usage. This analysis is only relevant for this type of product; it does not reflect trends for the full spectrum of incontinence products currently available on the market.

Graph 9 shows the change in material composition over the years between 1995 and 2005.

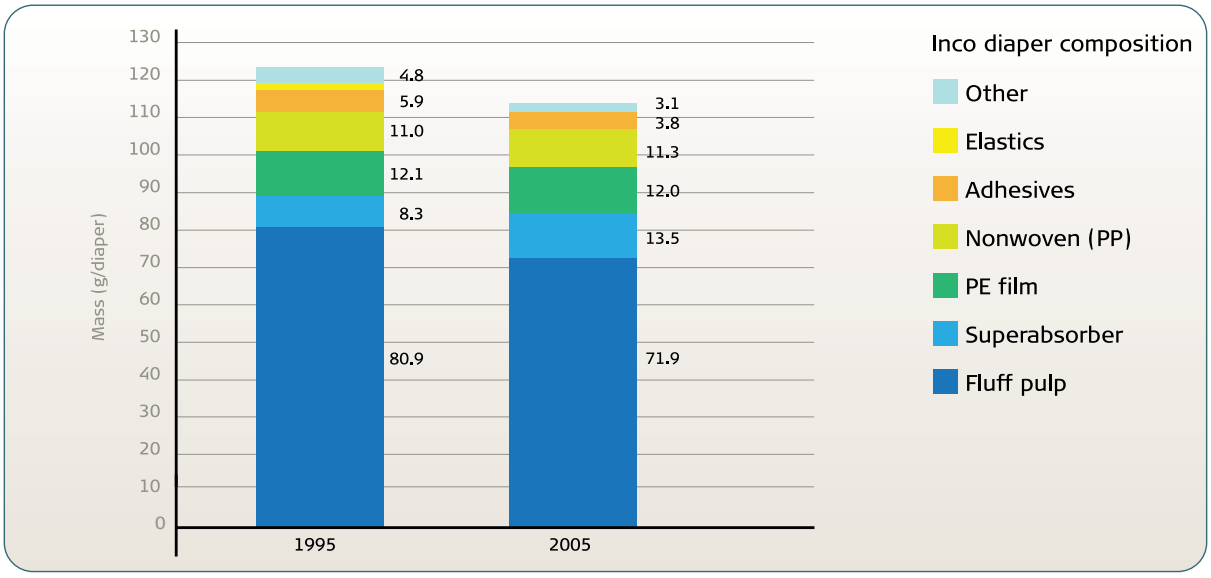
In addition to the product weight reduction of approximately 6.5 percent, the weight of packaging has been reduced by 22 percent from 13.3 kg per 1000 pieces in 1995 to 10.3 kg per 1000 pieces in 2005. As a result storage and transportation efficiencies were also achieved through the ability to accommodate more products per pallet.

It is important to note that the LCA data for the all-in-one product should not be seen to be reflective of the full range of incontinence products. In other incontinence products there has been an even greater reduction in weight; as much as a further 10 percent, as a result of the development of lighter and more efficient absorption cores. The main reason why there has not been a more significant reduction in the weight of the all-in-one product is because of the current classification systems for reimbursement and for some public procurement systems in Europe. These systems use test methods like Rothwell (ISO 11948-1) which measure the total absorbent capacity of a product using a 'dunk and drain' technique. This method favours products with high amounts of absorbent material; thus making weight reduction and the provision of a thinner product difficult in those situations. EDANA is currently developing alternative test methods which aim to help to overcome this limitation on product improvement opportunities.

Graph 10 provides an overview of the trends for the major environmental indicators for the all-in-one product and illustrates similar trends to those seen for baby diapers. These improvements can be attributed to changes in product specification, improvements in product packaging, efficiencies in production processes and developments in waste management.

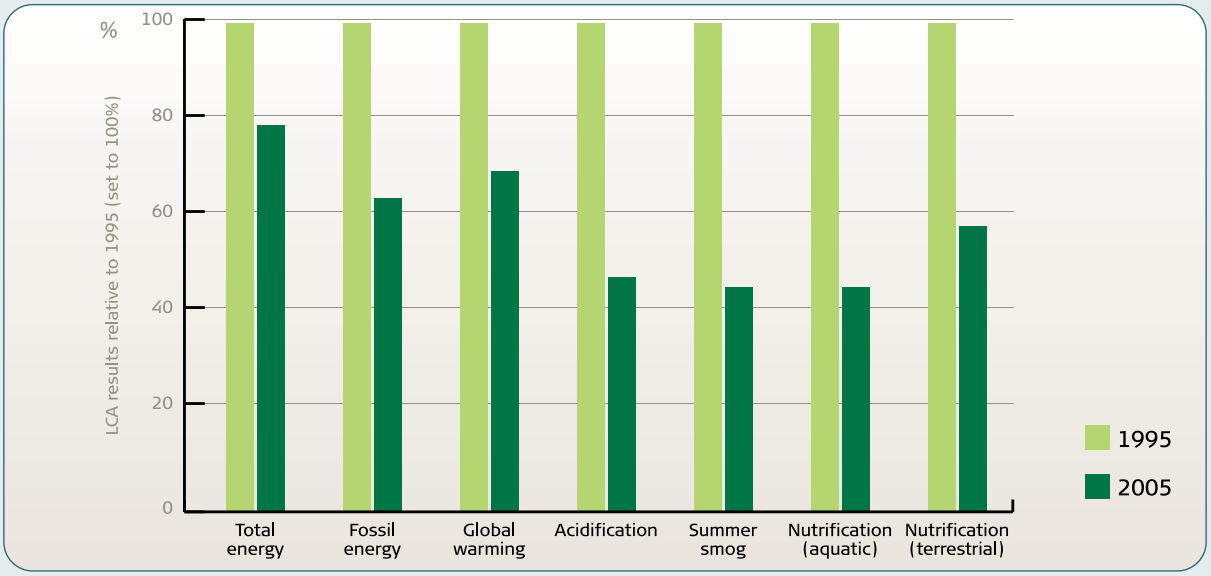
Graph 9

Comparison of Material Composition for an All-in-one Incontinence Product 1995 to 2005



Graph 10

Trends for All-in-one Incontinence Products on Major Environmental Categories 1995 – 2005

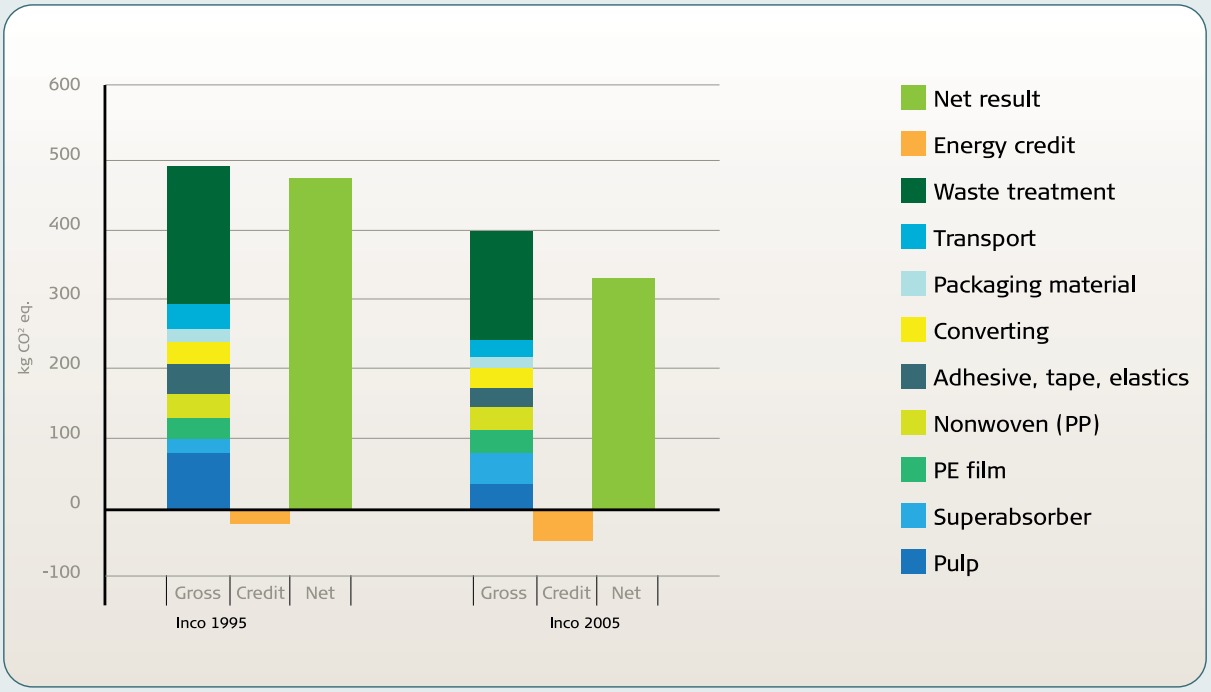


Looking at where reductions are generated in specific impact categories, similar trends in global warming are illustrated for incontinence products as for baby diapers, see graph 11 below. Like Graph 8, this graph shows the overall impact on global warming segmented by the constituent parts of the functional unit in 1995 and 2005. The gross column shows the impact of each material or process. Credits come from energy recovery processes such as thermal water treatment which generates power. The net column is therefore the overall impact. As with baby diapers, the share from superabsorbents has increased but the overall trend shows a more efficient use of resources both in the materials used and in the production processes applied.

The trend analysis for incontinence products has confirmed that there has been positive progress over the 10 year period under evaluation. An analysis of the drivers behind reduced environmental impacts shows that the change is due to improved product design and production processes as well as improvements in the individual components.

Graph 11

Improvements in Global Warming Impacts for Incontinence Products 1995 - 2005

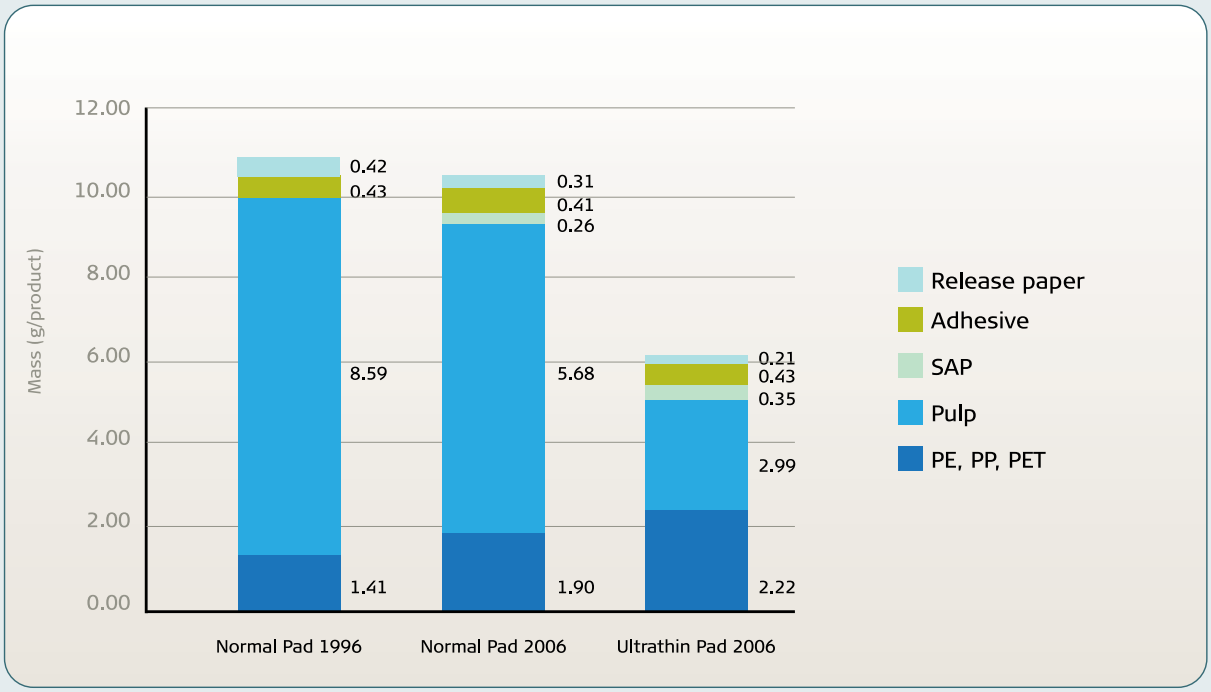


Feminine Care Products

To date no independent LCA has been undertaken for feminine care products so there is no industry-wide data available at this stage. Sanitary pads have in the main undergone similar product developments to baby diapers and incontinence products. They have become thinner and there have been a number of innovations in product design to achieve less leakage. In-house LCAs on pads by member companies have indicated similar environmental improvements for pads as for baby diapers and incontinence products; mainly as a result of improvements in the production process, and changes in product design and composition. Graph 12 shows the changes that have occurred in material composition for pads comparing both equivalent products in 1996 and 2006 and ultrathin (now representing the largest segment of the pad market).

Graph 12

Comparison of Material Composition for Normal and Ultrathin Sanitary Pads 1996 to 2006



Comparative LCAs – Disposable and Cloth Diapers

There has been an ongoing debate about the relative environmental impacts of disposable and reusable cloth diapers. Independent consumer organizations in several European countries have evaluated both diaper systems; cloth and disposable. They have concluded that both systems impact the environment, albeit in different ways and that the environmental superiority of any one diaper option over the other cannot be determined.

These conclusions have been quantified in numerous studies conducted in many countries around the world. There are various numerical differences in these studies as a result of different methods and assumptions, different geographies, and differences in regional infrastructure. The overall diaper LCA record however supports the general conclusion that none of the diaper options is environmentally superior in all its aspects. Both cloth and disposable diaper systems cause emissions and use some energy, water, and natural resources. The overwhelming majority of diaper life-cycle studies conclude that cloth diapers consume more water and produce more waterborne emissions than disposable diapers, while disposables produce more solid waste and consume more natural resources.

In 2001, the UK Environment Agency, the UK Government's lead body on protecting and improving the environment in England and Wales, commissioned an independent and objective environmental LCA of diaper use in the UK. The report of this detailed life cycle assessment of the environmental burdens associated with the production, use and disposal of cloth and disposable diapers was published in May 2005 and confirmed the earlier conclusion that no one diaper option is environmentally superior.

In this assessment the impact of three diapering systems were considered: cloth diapers with home wash, cloth diapers with commercial laundry, and disposable diapers. The environmental impact associated with an average child wearing nappies during the first two and half years of its life was considered.

The study found that:

- there is no significant difference between any of the environmental impacts of the disposable, home-use reusable and commercial laundry systems that were assessed. No system had a better or worse environmental performance although the life cycle stages that are the main source for these impacts are different for each system;
- for all three diapering systems the impacts from waste management do not contribute substantially to overall waste totals in the UK;
- the global warming and non-renewable resource depletion impacts over the 2.5 years in which a child is assumed to be using diapers are comparable with driving a car between 1300 and 2200 miles (2100 and 3500 km).

The study encouraged disposable diaper manufacturers to focus on weight reduction and improvements in materials manufacturing and reusable users to focus on reducing energy consumed in washing and drying. We accept this responsibility and will continue to work on reducing the weight of absorbent hygiene products and making improvements in materials manufacturing.

"There was no significant difference between the overall environmental impacts of the disposable, home-use reusable and commercial laundry systems that were assessed."

8. Prudent Use of Natural Resources

Sustainable Forest Management

The use of wood pulp in absorbent hygiene products is a small part of total wood consumption. Paper products including newspaper, copy paper, household and hygiene paper consume about 15 percent of the total worldwide commercial wood production. Only a very small amount, less than 1 percent, is used globally for manufacturing disposable diapers, feminine care products and adult incontinence care products.

Fluff pulp is the common name given to the cellulosic part of the absorbent cores in many absorbent hygiene products. There are many different grades of wood pulp derived from different species and processes. Hardwood is derived from species classed as Angiospermae (including eucalyptus and oak). Softwood is derived from species classed as Gymnospermae (including conifer and pine). While most paper making processes use both types of wood, fluff pulp uses only softwood fibres. This is because softwood contains coarse, bulky, long fibres which provide increased fluid retention and liquid distribution.

Most of the softwood used in the manufacture of absorbent hygiene products is grown in the northern hemisphere, mainly in North America and Europe. No wood from virgin tropical rainforests is used in the manufacture of absorbent hygiene products.

Sustainable production of timber is at the core of pulp production. Forests store carbon in growing trees and add humus to the soil. Well managed forests actually result in a net increase in the standing volume of timber over unmanaged forests. Well managed forests will typically address the following considerations:

- biodiversity conservation;
- sustainable production;
- forest health and vitality;
- soil and water quality;
- global carbon cycles;
- socio-economic benefits;
- cultural heritage.

One of the mechanisms for ensuring forests are well managed is through third party verification of forest management, including environmental and social considerations. We closely follow the development of different Forest Certification Schemes both on an international and national level. There are several national, regional, and international voluntary schemes including:

- the Forest Stewardship Council (FSC);
- the Programme for the Endorsement of Forest Certification Schemes (PEFC);
- the Sustainable Forestry Initiative (SFI) in the United States;
- the Canadian Standards Association (CSA).

Members of EDANA are committed to supporting sustainable management of forests based on sound ecological science, social responsibility and economic viability. We encourage third party verification or certification of compliance with sustainable forestry practices when it contributes to improvement in practices. We encourage development of standards, performance measures, and continual improvement in best practices for forest ecosystems. We recognize the benefits the methods employed by certification schemes bring to forest product companies since most schemes create a formal organizational framework for the setting of goals and operations as a whole. However, we do not specify certification by any single organization.

Pulp Production

Pulp production is a high-technology multi-stage process which extracts the natural polymer cellulose from wood. Wood comprises:

- cellulose (40-55 percent);
- hemi-cellulose (8-30 percent);
- lignin (20-30 percent);
- other compounds such as lipids, waxes, resins and proteins (1.5-5 percent).

Bark is removed from the trees using a rotating mechanical de-barker and the bark, together with recovered lignin, can be used to provide most (or even a surplus) of the energy for the mill or can be sold to a combined heat and power plant. The wood is then broken down into chips which are put in to the pulping process. The lignin (a component of the cell wall), provides the strength and rigidity of the plants and needs to be removed from the pulp. This is achieved through a number of processes. The wood chips are 'cooked' in a digester with chemicals which removes some of the lignin. The recovered lignin is either used for energy or processed and used for a variety of purposes such as road surfacing and animal feeds. The cooking chemicals are recovered and re-used. In fact many mills are largely self-sufficient in their energy requirements, reducing the environmental impact of their overall operations.

The pulp is then diluted and bleached which removes the remaining lignin and creates the properties required for the end product. The Elemental Chlorine-Free (ECF) method uses chlorine dioxide to remove lignin. Bleaching can also be performed using non-chlorine based compounds such as oxygen, hydrogen peroxide and/or ozone. This is called Totally Chlorine Free (TCF) bleaching.

ECF and TCF processes are different but neither is environmentally superior to the other. Waste products from both the ECF and TCF methods can be recycled, further reducing any environmental effects.

The resulting pulp can be used on-site in the manufacture of final product or alternatively the water can be removed and the pulp formed into sheets or reels. This is then packaged and transported by lorry, ship or rail to customers for further use.

Rayon/Viscose Production

Rayon, also known as viscose, used in tampons is made from natural origin cellulose derived from wood pulp. This natural base gives it many of the characteristics; reasonable cost, diversity, and comfort, that have led to its popularity and success. It is a very versatile fibre which has the same comfort properties as other natural fibres and can imitate the feel and texture of silk, wool, cotton and linen.

In its production, purified cellulose is chemically converted into a soluble compound. A solution of this compound is passed through a spinneret to form soft filaments that are then converted or "regenerated" into almost pure cellulose. After the spinning stage the fibres can be bleached in either ECF or TCF processes. Because of the reconversion of the soluble compound to cellulose, rayon is referred to as a regenerated cellulose fibre. The absorbent hygiene fibres meet the purity requirements of the European Pharmacopeia.

Rayon producers are employing a number of techniques to reduce the emission of zinc and hydrogen sulphide in the production process. Some of the techniques being used are the recovery of zinc by ion-exchange, crystallization, and the use of more purified cellulose. Also, the use of absorption and chemical scrubbing is proving to be helpful in reducing gas emissions.

Cotton Production

Cotton is a soft fibre that grows around the seeds of the cotton plant *(Gossypium sp.)*, a shrub native to tropical and subtropical regions around the world, including the Americas, India and Africa. Virtually all of the commercial cotton grown today worldwide is grown from varieties of the native American species *Gossypium hirsutum* and *Gossypium barbadense*.

Cotton fibre, once it has been processed to remove seeds and traces of wax and protein, consists of nearly pure cellulose, a natural polymer. Cotton production is very efficient, in the sense that ten percent or less of the weight is lost in subsequent processing to convert the raw cotton bolls (seed cases) into pure fibre. The cellulose is arranged in a way that gives cotton fibres a high degree of strength, durability, and absorbency. Each fibre is made up of twenty to thirty layers of cellulose coiled in a neat series of natural springs.

The cotton used in the absorbent core of tampons is very short in length and is known as cotton comber or cotton linters. These are the fibres that remain on the cotton boll after the longer fibres have been removed for textiles. The fibres are bleached in either ECF or TCF processes and meet the purity requirements of the European Pharmacopeia.

“ The wood pulp used in absorbent hygiene products represents less than one percent of total wood consumption. ”

Polymers from Renewable Resources

Polymers derived from renewable sources can be used to produce compostable plastics. They have been available in limited quantities for many years and have generally been used to produce plastic films for use in packaging and organic waste disposal applications. These films can also be used in absorbent hygiene products. Currently there is a cost differential between polyolefin resin and resin derived from these polymers of a factor of one to three. In a cost sensitive market such as absorbent hygiene products this presents a significant barrier. Currently cost and availability restrict the use of such materials to absorbent hygiene products within low volume specialized niche markets. This may well change however as availability increases and economies of scale emerge.

More recent developments have seen the emergence of fibres made from polymers from renewable sources. Such fibres can be used in nonwoven applications and providing there is economic fibre supply these could be interesting developments for the future, which the absorbent hygiene products industry is monitoring.

The environmental impact of such polymers must be measured by a complete cradle to grave LCA approach. The fact that they are derived from renewable resources does not automatically mean that they are better for the environment. All energy consumption and emissions occurring in the production process and its conversion into a substrate need to be considered. The broader sustainability issues surrounding these polymers are complex and include the $C0_2$ emissions that occur in the degradation of biodegradable materials, the ethics of using food crops, and the use of arable land to grow precursor materials.

New materials must also be assessed in terms of their safety profile and their performance to ensure that there is no deterioration in either the performance or the safety of the final product compared with those produced using existing materials.

The absorbent hygiene product industry will continue to monitor opportunities to use sustainable alternatives to fossil fuel-based resources while at the same time continuing to reduce the amount of material in our products which is the most effective way to minimise their environmental impact at the current time.

The Absorbent Hygiene Product Manufacturing Process

There are three basic processes in the manufacture of diapers, incontinence products and sanitary pads. They are:

- the fiberization of the fluff pulp, addition of superabsorbent polymer (where appropriate) and absorbent pad formation;
- lamination with films, nonwoven substrates and elastic elements;
- shaping, cutting, folding and packaging.

These three elements have remained the same over the past two decades even though the processes have changed dramatically with the introduction of new technologies. Major steps have been taken by manufacturers to increase production line efficiency and reduce manufacturing waste.

In terms of raw material selection, each must be capable of being supplied with consistent quality to support high speed manufacturing processes.

Today there are two main technologies used to manufacture tampons:

- the coiled tampon type starts with a rectangular fibre pad around which a withdrawal cord is looped. The fibre pad is then asymmetrically folded and rolled and then compressed to a cylindrical shape. A number of longitudinal or helical grooves are formed by the compressing operation. This type of tampon expands radially. Most digital tampons are coiled tampons;
- the second type (typically used for applicator tampons) starts from a rectangular fibre pad. A withdrawal cord is sewn across the length of the tampon fibre pad which is then compressed to a cylindrical shape. Alternatively the withdrawal cord can be attached after the compression by pierce and loop attachment of the cord at the bottom section of the tampon. The tampon expands widthways and lengthwise.

Both tampon types are usually covered with a nonwoven or perforated film.

The technology required for absorbent hygiene products development and manufacturing is highly complex. There are a large number of specialist equipment and material manufacturers who work with the industry to drive process and product efficiencies. A major consideration in deciding on machinery, product and material design innovations is whether they have the capacity to consume less and use thinner, lighter materials. This contributes not only to a better product, but also to better environmental performance – a measure that the industry is committed to continue to improve.

The manufacturing process itself has little environmental impact. The fluff fiberization and pad formation process generates heat, noise and some dust. Normal Good Manufacturing Practice (often referred to as GMP) requires that these conditions be controlled within the facility by soundproofing, ventilation, dust and fibre recycling and air filtration systems. There are no significant atmospheric or waterborne emissions caused as a result of normal operating conditions.

The lamination of substrates is primarily achieved by hot melt adhesives; thus avoiding the use of solvent-based adhesives and their associated environmental and physiological effects. Typical adhesive melting temperatures are generally in the 130-160 degrees centigrade range. Currently, lower melting point adhesives are being developed which may help reduce the energy consumption required to keep the glue molten. Some hot melt adhesive is shipped in returnable pallets without packaging so that the packaging is part of the adhesive and melts along with the glue.

Creating an anatomic shape in many hygiene products does create some off-cut waste. However, with appropriate processes in place, this material can be reduced, re-used or re-cycled as no contaminants are present. The remaining cut off material that cannot be used is safely disposed of in line with existing and applicable regulations; for example it can be used as refuse-derived fuel (see page 48).

“A major consideration in deciding on machinery, product and material design innovations is whether they have the capacity to consume less and use thinner, lighter materials.”

9. Absorbent Hygiene Products and Waste Management

Managing waste effectively is becoming an increasingly important challenge to modern society. At their origins, solid waste management practices were developed to address the adverse effects on public health of the ever growing amounts of solid waste being discarded without appropriate collection or disposal. As a society we now have to focus on producing less waste while at the same time ensuring we have an effective system for managing the waste that is produced.

There are four major considerations in developing sustainable waste management systems. They need to:

- ensure human health and safety;
- be environmentally effective;
- be economically affordable;
- be socially acceptable.

In Europe the development of more sustainable waste management systems is characterized by the adoption of an integrated approach to waste management system design. This includes an optimized waste collection system and efficient sorting followed by one or more of the options below in order to recover value as materials, organics or energy prior to landfilling the residues:

- materials recycling which will require access to reprocessing facilities;
- biological treatment of organic materials to produce marketable compost and to reduce volumes for disposal;
- anaerobic digestion which produces methane that can be burned to generate energy;
- thermal treatment such as incineration which will reduce volume, render residues inert and should include energy recovery;
- landfill which will either increase amenity via land reclamation or will, through well-engineered sites, at least minimize pollution and loss of amenity.

An environmentally effective waste management system needs to contain all of these treatment options. Currently landfill is the only method that can accept all types of waste since recycling, composting and thermal treatment all leave some residual material that needs to be landfilled. Use of the other options is necessary prior to landfilling in order to divert the key recoverable parts of the waste stream. This approach will reduce the volume and improve the physical and chemical stability of the final residue thus reducing both the space requirement and the environmental burdens of the landfill.

Absorbent Hygiene Products in Municipal Solid Waste

Much of the discussion about absorbent hygiene products in Municipal Solid Waste (MSW) focuses on baby diapers. In those households where disposable baby diapers are used, they naturally seem to represent a significant proportion of what goes into the bin. However, only one in 14 households on average will be using diapers at any one time.

MSW includes household waste and similar waste from commerce and trade, small businesses, office buildings and institutions (schools, hospitals, government buildings).

“Only one in 14 households on average will be using disposable diapers at any one time.”

It also includes waste from selected municipal services, such as park and garden maintenance and street cleaning services. MSW data in Europe is difficult to aggregate because of the differences in the way waste data is defined and reported. Based on available data, it is calculated that municipal solid waste comprises between 6 and 15 percent of all waste in Europe (depending on what is included in its definition). Current estimates are that baby diapers make up about two percent of MSW in Europe.

By comparison paper and board, garden waste and food waste each comprise between 18 and 20 percent of MSW. Waste from absorbent hygiene products only comprises less than 0.5 percent of total solid waste. Please see graph 13.

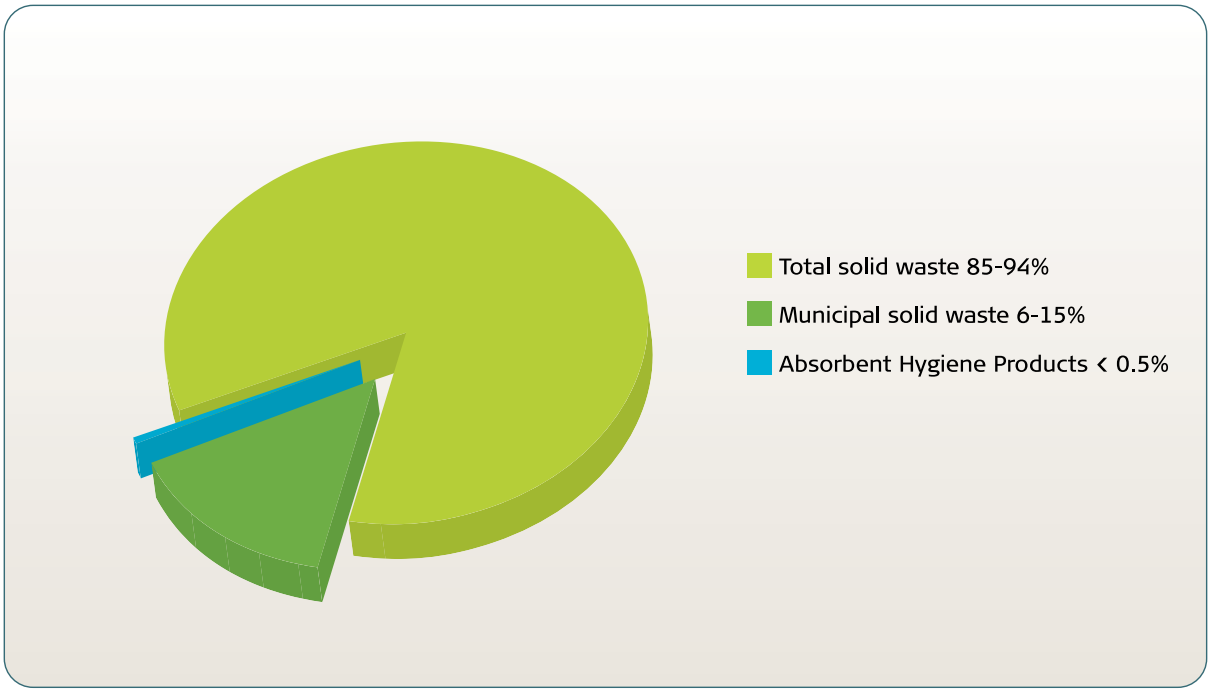
Landfill

Landfill currently stands alone as the only waste disposal method that can accept all materials in the solid waste stream. As land prices and environmental pressure increase however, it is becoming more difficult to find suitable landfill sites. In addition, European regulation in the form of the EU Landfill Directive (99/31/EC), which came into force in 1999, has set ambitious targets for the reduction of biodegradable waste sent to landfill of 75 percent of the 1995 level by 2010.

Absorbent hygiene products behave like other forms of MSW and are readily compressed and contained in landfills. Neither their ingredients nor the waste they contain can migrate from properly constructed and maintained landfills. Tests conducted with diapers under a variety of conditions simulating landfills demonstrate that these materials do not present any public health or environmental safety risk, (see References: Absorbent Hygiene Products and Waste Management, p 69-70).

Graph 13

Absorbent Hygiene Product Waste Contribution to MSW and to Total Waste in the European Union



Incineration (Thermal Treatment)

Thermal treatment of solid waste includes at least three distinct processes: mass burn, refuse-derived fuel burn, and paper and plastic fuel burn. The most well known is mass-burning, or incineration, of mixed MSW in large incinerator plants. The two additional 'select-burn' processes burn combustible fractions from the solid waste as fuels. These fuels can be separated from mixed MSW either mechanically to form Refuse-Derived Fuel (RDF), or can be source-separated materials from household collections such as paper and plastic, which have been recovered but not recycled. The incineration of solid waste can fulfil three distinct objectives:

1. volume reduction: depending on its composition, incinerating MSW reduces the volume of solid waste to be disposed of by on average 90 percent and its weight by 70-75 percent;

2. stabilization of waste: incinerator output (ash) is considerably more inert than incinerator input (MSW), mainly due to the oxidation of the organic component of the waste stream. Incinerator output can also be used for other purposes; for example in the United Kingdom the larger particulate ash is used to make hardcore for road building;

3. recovery of Energy from Waste (EfW): energy recovered from burning waste is used to generate steam for use in on-site electricity generation or export to local factories and district heating schemes.

Absorbent hygiene products can be incinerated in all modern incinerators, including those designed for energy recovery. Relative to average municipal solid waste, they do not adversely affect safety or regulated emissions from waste to energy incineration processes, and are compatible with waste to energy operations and energy recovery systems in incinerator plants. In fact they can positively contribute to the effectiveness of thermal treatment because:

- the high quality of absorbent hygiene product materials positively affects the overall ash quality in terms of heavy metal load because of the low or undetectable amounts of heavy metals compared to average municipal solid waste;
- the low ash content of absorbent hygiene products ensures a very high weight/volume reduction (approximately 90 percent) during incineration. Ash production from absorbent hygiene products is less than 10 percent by weight compared to 25 percent or more for average municipal solid waste.

For hygiene reasons, especially for waste from healthcare facilities, incineration with energy recovery is a very valuable option for absorbent hygiene products. Examples exist of care homes building heating systems that use the energy generated from burning diapers and incontinence products. The system can then provide hot water and heating for the care home achieving significant savings in gas, oil and waste disposal costs.

"Waste from absorbent hygiene products only comprises less than 0.5 percent of total solid waste."

Biological Treatment

Biological treatment can be used to treat both the organic and the non-recyclable paper fractions of solid waste. There are two treatment types; composting (aerobic) and biogasification (anaerobic). Either can be used as a pre-treatment to reduce the volume and stabilize material for disposal in landfills or as a way of producing valuable products from the waste stream such as compost and (from biogasification) biogas plus compost.

The raw material composition of today's absorbent hygiene product is compatible with composting provided there is appropriate technology available to separate the biodegradable, cellulose-based parts from the synthetic pieces. Although there are operations in Europe that accept diapers as part of the compostable household waste, in most cases, EDANA does not actively recommend that absorbent hygiene products should be composted with other household bio-waste. Absorbent hygiene products are unsuitable for garden composting because of the difficulty in separating the biodegradable and synthetic components of the product.

Mechanical Biological Treatment (MBT)

Mechanical-Biological Pre-Treatment (MBT) is a hybrid technology. It is a combination of mechanical sorting, biological treatment, and sometimes a processing stage to convert the residual material into Refuse-Derived Fuel (RDF).

There are a wide range of configurations of MBT processes – each with their particular advantages and disadvantages. They vary in functionality and perform differently in terms of the waste input that can be treated.

The MBT process is able to accept used absorbent hygiene products, although some process designs will lend themselves to handle them more effectively than others. The shredding process will effectively separate the various raw material fractions. Further down the process, the body waste and pulp will biodegrade. The remaining inert fraction (for example, plastic material) will leave the MBT facility as biologically inactive residue that can be incinerated or landfilled with reduced volume.

Recycling

Material recycling is a valuable component of an integrated solid waste management strategy. It can help conserve resources, it can divert waste from final treatment and disposal and it involves the general public in waste management (for example, cans, paper, and bottles). Unlike re-use, recycling typically involves an industrial process which differs from the original process primarily in that some of the virgin resources have been replaced by secondary ones. While recycling as a waste treatment option might be technically conceivable for absorbent hygiene products, there is a high level of uncertainty about the marketability and acceptability of the re-use of the end products, as well as constraints on the environmental benefits for separate recycling in relation to the economic costs. A recent trial project in Belgium in 11 municipalities, where diaper waste was collected separately, concluded that there was insufficient data on the environmental gain to justify a separate collection for recycling purposes. This project confirmed that the economic feasibility of recycling absorbent hygiene products is constrained by the high costs of collecting the soiled products as an individual fraction of waste.

Industry Playing its Part to Find Solutions

The manufacturers of absorbent hygiene products take their responsibilities for reducing waste very seriously. Individual member companies work hard to reduce the waste that is generated in their development and manufacturing processes as well as in the finished article itself. We recognize that we can also help to find new and innovative solutions to reducing waste in the community. Through EDANA's membership of The Association for the Sustainable Use and Recovery of Resources in Europe (ASSURRE), an industry led multi-sector association which existed from 2000 to 2007 to promote sustainable resource management and full life-cycle thinking in EU policy, we addressed some of the external challenges on solid waste by our involvement in a number of projects:

- the Mechanical Biological Pre-Treatment Project documented the technological capabilities of this emerging waste treatment method to determine its waste minimization potential and its compatibility with existing infrastructures and was published in March 2005;

- an assessment of the compatibility of used baby diaper waste with various MBT processes which was completed in December 2006.

Through involvement with projects like these we want to improve our understanding of waste issues and, in partnership with others, be part of the solution.

10. Environmental and Financial Policies and Instruments

Local authorities, national governments, the European Union and international organizations are all increasingly using policies and instruments in order to pursue environmental objectives and to ensure that these objectives are integrated into other sectoral and economic policies. Such policies and instruments include:

- taxes and tradable permits;
- green public purchasing programmes and initiatives;
- voluntary approaches such as negotiated agreements, voluntary public programmes and unilateral commitments by firms.

EDANA supports the introduction of measures which will reduce the overall environmental burden and we welcome opportunities to work with local authorities, national governments and the European Union to identify ways to improve the environmental efficiency and effectiveness of our products and activities. Our experience is that the most successful policies and procedures are developed in partnership with the relevant parties so that all of the implications and consequences can be considered upfront and policies developed accordingly.

It is important to ensure that such policies and instruments do not indirectly discourage innovation or distort markets.

Eco-labelling Schemes

The stated objectives of environmental labelling schemes such as the Nordic Swan and the EU Flower are to prevent, reduce and eliminate environmental pollution, and to encourage sound management of raw materials resources, by promoting products with a reduced environmental impact, and by providing consumers with more and better information on the environmental impact of these products.

EDANA supports these objectives and believes that if eco-labelling schemes are going to succeed in meeting the objectives, it is important that such schemes encourage rather than restrict environmental innovation.

The industry also believes that measurement criteria for eco-labelling schemes should be based on life cycle information which will fully inform the consumer about the environmental impact of a product through all its stages of production, use and disposal. Measurement criteria must not limit innovation and creativity, and should be adaptable to fast changing technologies, such as those applied to the manufacture of absorbent hygiene products.

The absorbent hygiene products industry supports open environmental communication and considers the international standard series of ISO 14020 on environmental labelling an appropriate mechanism for this purpose. In addition, Type III - Environmental Product Declarations (ISO 14025) are based on life cycle assessment and are independently verified. The basis for the measures are ultimately established as Product Category Rules for any given specific product type. It is the industry's belief that this could be an instrument which has the potential to succeed in achieving environmental communication objectives, while at the same time encouraging innovation.

Financial Incentives

We do not believe it is appropriate for authorities to offer financial incentives to users of cloth products as a way of attempting to reduce solid waste. As absorbent hygiene products only contribute less than 0.5 percent to the total solid waste stream, this is a very blunt instrument to use which will only have a trivial impact on the overall amount of solid waste generated. Distorting the market by providing subsidies of this sort unfairly favours one section of the industry over another. They also fail to recognize that life cycle assessments have proved quite categorically that no one diapering system can be judged less harmful to the environmental than the other when all the relevant factors are taken into account.

VAT on Absorbent Hygiene Products

Current EU law stipulates that Member States may apply reduced VAT rates to a number of specified goods and services which are deemed to be essential goods and services meeting a social or cultural policy objective. While sanitary products as a category are included, and incontinence and sanitary products are specifically mentioned, baby diapers are not. This ambiguity has led to inconsistency in the interpretation of the regulations within member states and received greater prominence in recent years because the 10 EU accession countries all apply partially reduced VAT rates to baby diapers. As a result in 2006 the Commission announced that it would carry out a review of the Directive.

Family associations, including nine pan-European and six national family organisations, have joined forces to call for reduced VAT on diapers across Europe. This is the first time that these associations have come together to advocate at a European level on a single issue. In addition, a European Parliamentary (EP) Hearing took place during which the President of the EP's Intergroup on the Family called for reduced VAT on childcare items. These events coincided with the International Day of the Family on 15 May 2007.

In early July 2007 the Commission published a Communication on VAT along with an economic study: "Study on Reduced VAT applied to goods and services in the member states of the European Union". This has launched a consultation on how to simplify current EU legislation on VAT. A final Commission proposal on this subject is not expected until later in 2008.

The absorbent hygiene industry is supportive of the views of family associations and has noted with interest that an economic study on VAT reduction on diapers in Portugal showed that actual market price reductions equated directly to the tax cuts, providing significant savings to families, demonstrating the benefits of such a change if it were to be generalized across the European Union.

"Our experience is that the most successful policies and procedures are developed in partnership with the relevant parties."

Economic Aspects of Sustainability

11. The Absorbent Hygiene Products Market

The Market

Modern baby diapers are used for babies and young infants until toilet trained. Usage averages at 3600 to 4250 units per child during the "cuddling" period, up to 30 months, concentrated mainly in the first 18 months, and followed by the use of pant diapers and training pants during the child's toilet training phase.

Adult incontinence protection products, including fitted briefs, shields and pads, are used by men and women in cases of illness, temporary or permanent incapacity and handicap as well as the effects of ageing; their use is generally more long-term than baby diapers.

Sanitary protection products are used by girls and women throughout their active reproductive years and beyond in the case of pantyliners.

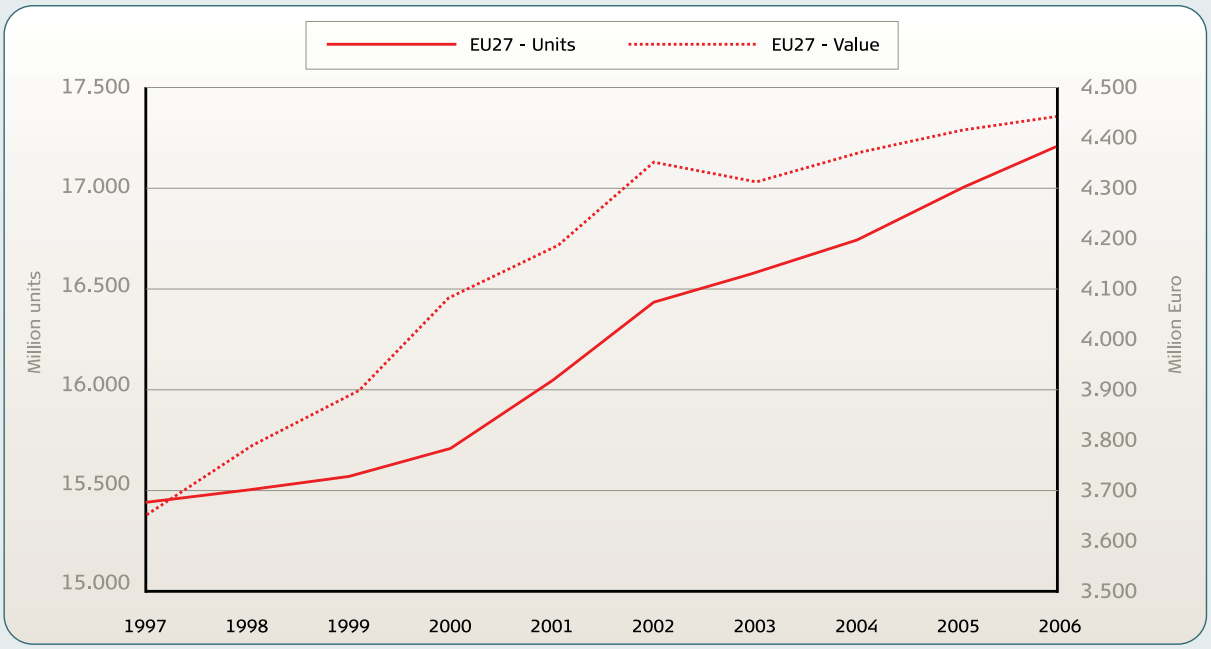
In 2006 the population of the European Union was estimated to be 492 million; it has increased by an average annual growth rate of 0.3 percent since 1997. The size of the 0 - 4 year old section of the population is estimated to be 25 million and has declined by 0.4 percent since 1997. The over 65 population is 82 million and has grown by 1.5 percent in the same period of time. The 15 - 49 year old female population has remained fairly static and was 120 million in 2006.

Unlike the fairly homogenous US market for hygiene products, the European market comprises different countries forming a number of regional sub-markets. Overall the European market is about the same size as the US market. There are significant variations between countries in terms of market penetration of absorbent hygiene products. There is considerable growth potential particularly amongst the newer member states where market penetration is considerably lower than in the mature markets of Western Europe.

The Baby Diaper Market

Graph 14 shows the growth of the baby diaper market from 1997 to 2006 for the 27 countries in the European Union by units and value. The current market as seen in graph 14 is estimated to have a value of 4.4 billion Euros comprising sales of 17.2 billion units. The figure rises to 19.2 billion units when non-EU countries and Turkey are included.

Graph 14 Baby Diaper Unit and Value Growth 1997 - 2006

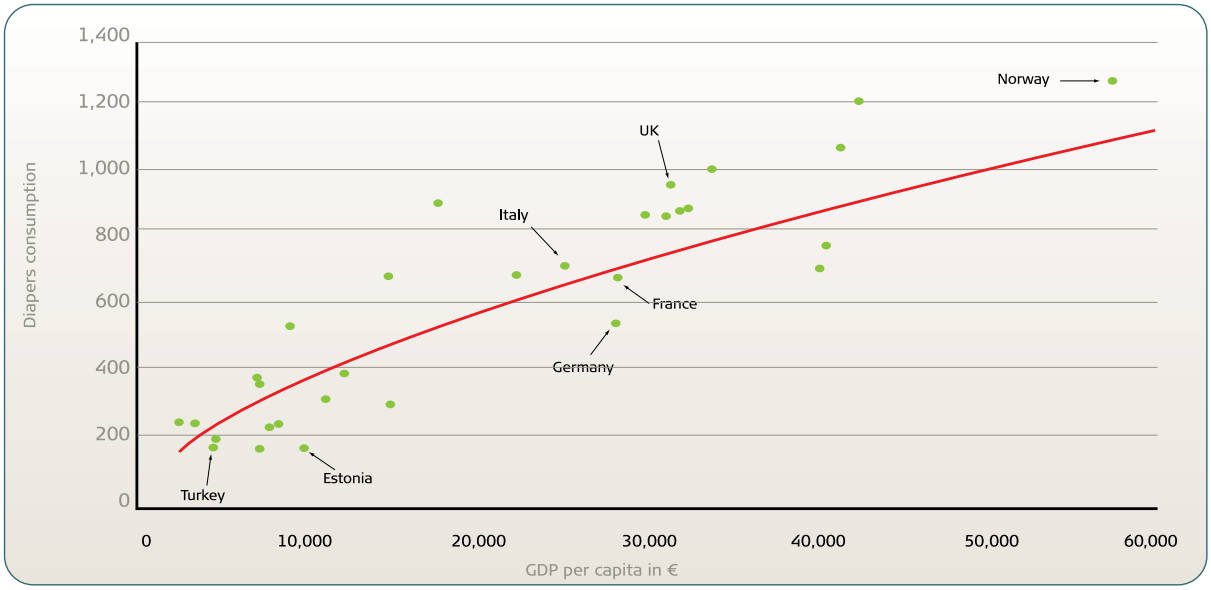


The total figures show annual growth of around 1.2 percent in the number of units sold over the past two years. The five largest markets for disposable baby diaper products, United Kingdom, France, Italy, Germany and Spain, together represent 60.2 percent of the current market. These are mature markets which, given the demographic trends mentioned, have only grown by an average of 1.2 percent since 2001. The fastest growing markets in Europe during the past five years were the Czech Republic, Iceland, Romania, Turkey and Ireland which, although currently representing only 9.9 percent of the total market, between them have grown by an annual average of 6.5 percent over the past five years and are forecast to continue to grow in the coming years.

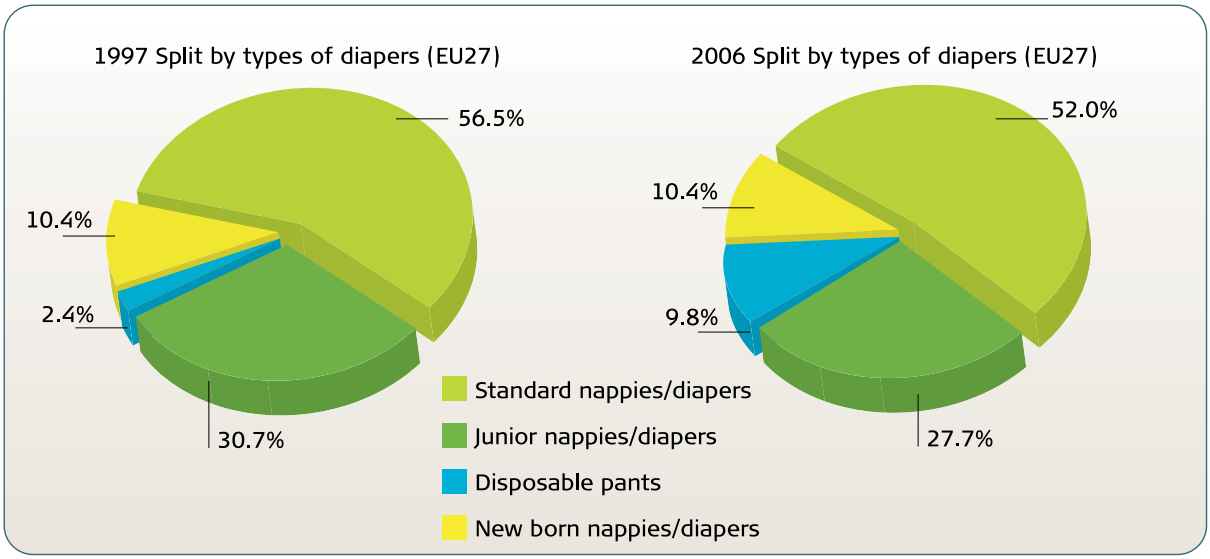
Graph 15 shows 2006 data for diaper consumption in EU27 plus Turkey compared with per capita GDP and illustrates the low consumption of Turkey and Estonia.

Graph 16 shows the changes in the mix of the baby diaper market over the past nine years in the EU27. The percentage of the market comprising new born diapers has stayed the same, but there has been an increase in the disposable pants market accompanied by a commensurate decrease in the standard and junior diapers.

Graph 15 Diaper Consumption per Infant versus GDP per Capita



Graph 16 Changes in the Baby Diaper Market Mix 1997-2006



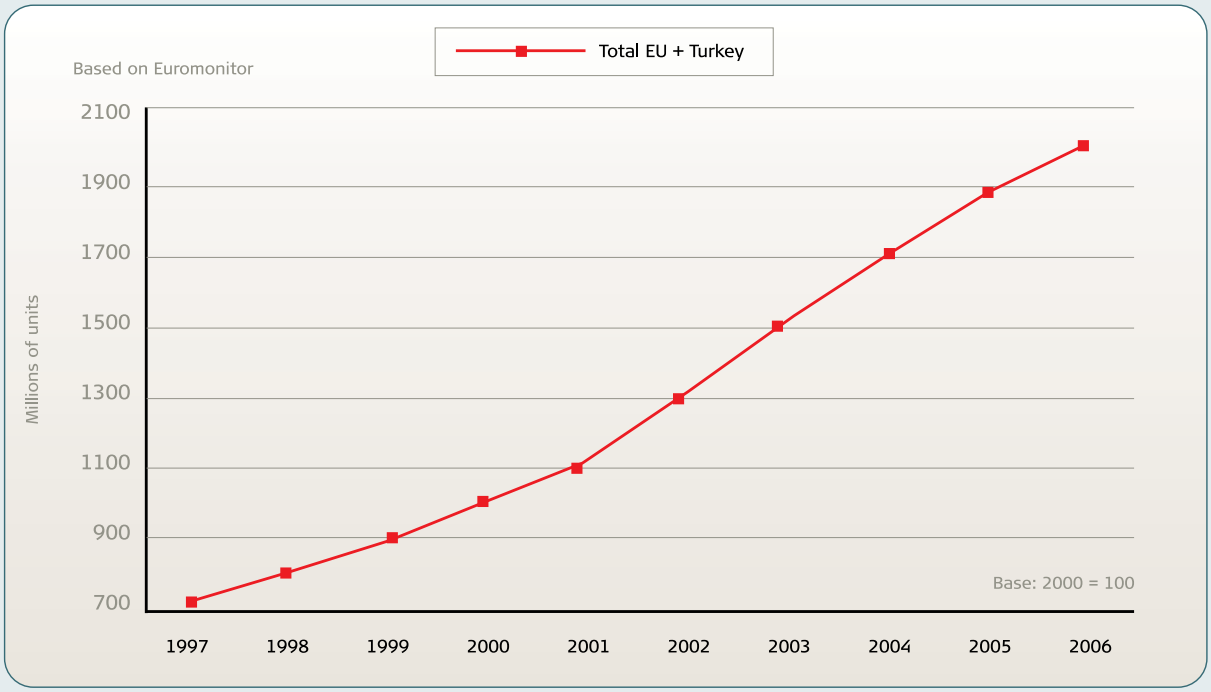
Incontinence Products

In 2006 the total estimated volume of incontinence products sold was around 5 billion pieces which includes body-worn all-in-one products, (briefs or pants mostly for severe incontinence), body-worn inserts (light, medium or severe incontinence) and under pads (bed or chair-pads). The retail market is becoming an increasingly important market for these products, growing from 26 percent of the total market in 1997 to 40 percent of the market in 2006. In 2006 it was estimated that the value of the total market for incontinence products was around 1.5 billion Euros.

Increased longevity and the ageing of the baby boomer generation in developed markets will continue to increase demand for age-related incontinence products. In addition, the significant transition in distribution from chemists and pharmacies where these products have been traditionally sold to mass market distribution, will further stimulate growth.

The growth in the retail market is seen in the graph below. In units, the market has increased from 727 million units in 1997 to 2 billion units in 2006 and since 2000 has shown an average annual increase of around 12 percent.

Graph 17 Annual Growth in Retail Sales of Incontinence Products 1997-2006



With the growth in the retail market the product mix has also changed as can be seen in graph 18 which shows the change in the overall market in the 5 largest markets between 1997 and 2006 with light incontinence product sales increasing from 51 percent to 73 percent of the total market.

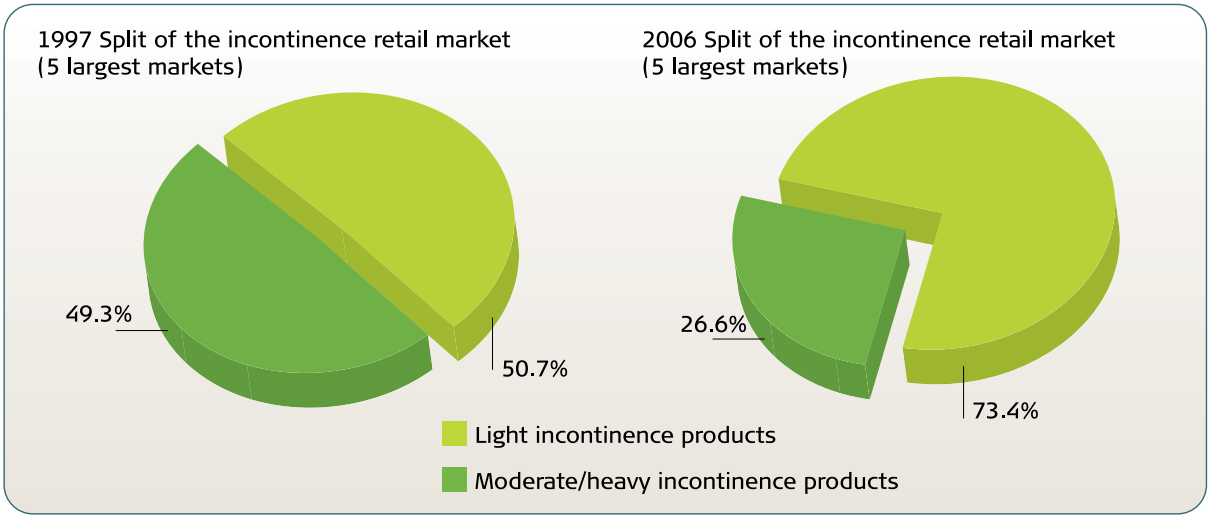
Feminine Care

In 2006 the total size of the feminine care market in the EU27 and Turkey was estimated to be 35.5 billion pieces, with sanitary pads comprising 41 percent of the market, pantyliners 43 percent and tampons 16 percent of the total market. In 2006 it was estimated that the value of the market for feminine care products in EU27 and Turkey was around 3.8 billion Euros.

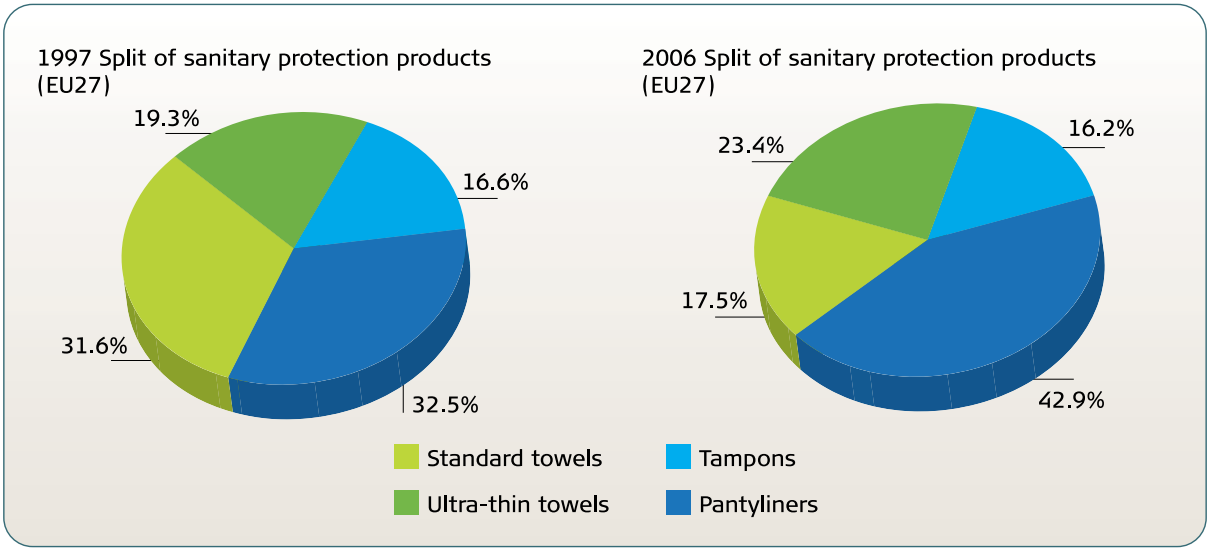
The mix in the market has changed quite significantly since 1997. While tampon sales have remained reasonably constant at around 16 percent of the total category, the number of pantyliners sold as a percentage of the total has increased from 33 percent in 1997 to 43 percent in 2006.

The overall market for feminine care products in the Europe Union has grown at an annual average growth rate of 1.3 percent over the past 10 years. The five fastest growing markets, Latvia, Romania, Lithuania, Hungary and Spain, currently represent some 14 percent of the overall market and have been growing at a combined annual average growth rate of 8.5 percent.

Graph 18 Split of Incontinence Product Mix 1997-2006



Graph 19 Changes in the Feminine Care Market Mix 1997-2006



12. The Absorbent Hygiene Products Industry

The Absorbent Hygiene Products Industry

The absorbent hygiene products industry comprises a diverse range of international and national companies, some dedicated solely to the manufacture of absorbent hygiene products, others members of larger manufacturers and distributors of goods. The industry is a combination of manufacturers of branded and private label products.

EDANA/HAPCO Members

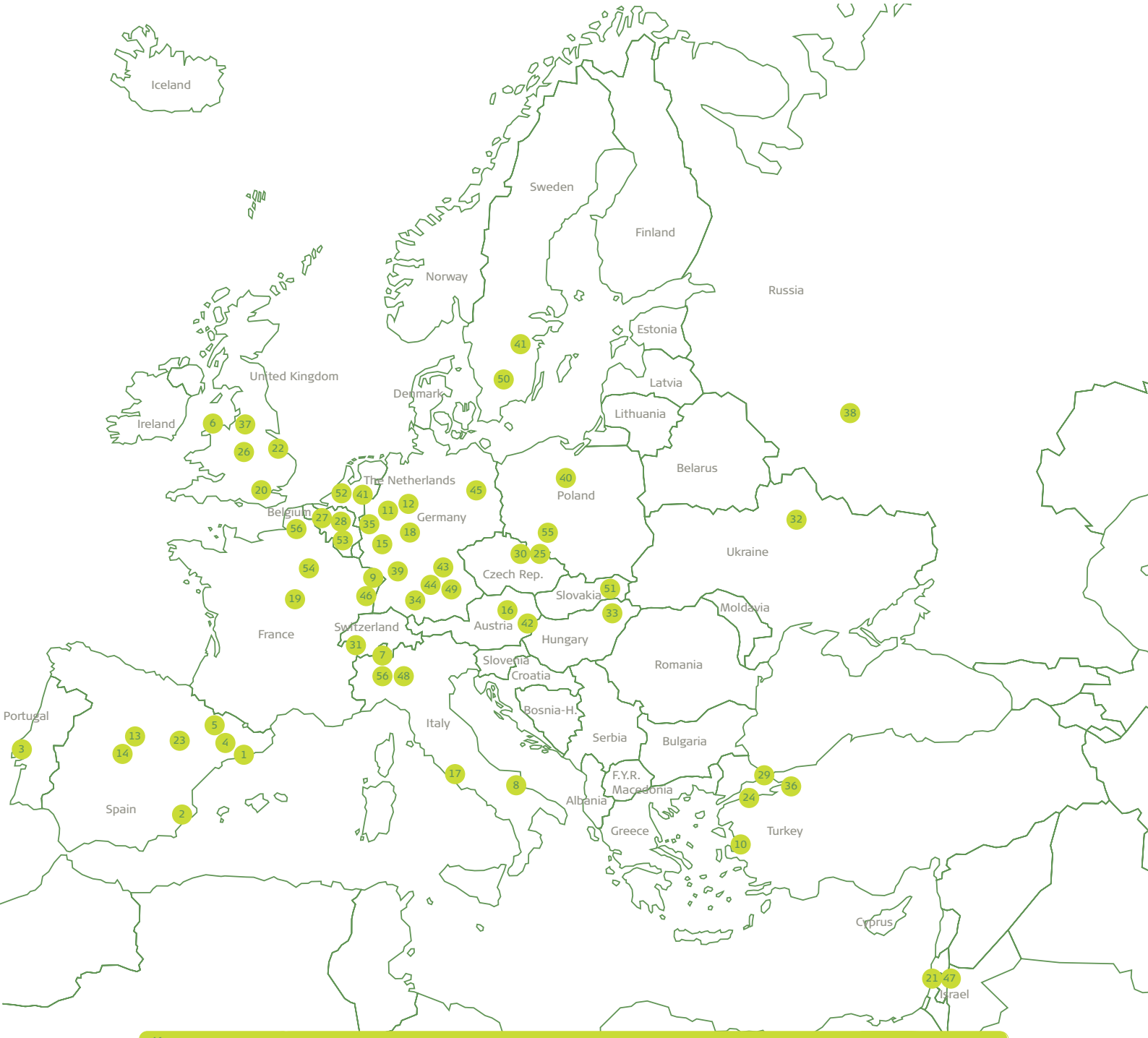
Arbora & Ausonia	www.arbora-ausonia.com
Arquest	www.arquest.co.uk
Artsana	www.artsana.com
Fater	www.fater.it
Georgia-Pacific	www.gp.com
Hayat	www.hayat.com.tr
Hyga	www.hyga-int.de
Hygiene Oederan	www.hysalma.de
Johnson & Johnson	www.jnj.com
Kimberly-Clark	www.kimberly-clark.com
Laboratorios Indas	www.indas.es
Lil-lets	www.lil-lets.com
Ontex	www.ontex.be
Paper-Pak	www.paperpak.com
Paul Hartmann	www.hartmann-online.com
Procter & Gamble	www.pg.com – www.eu.pg.com
Rostam	www.rostam.co.il
S.I.L.C.	www.silc.it
Santex	www.santex.it
SCA Hygiene Products	www.sca.com
Tyco Healthcare	www.tycohealthcare.fr

The industry invests widely in its European product development and manufacturing activities. The location of manufacturing facilities in the region is provided in figure 9, (see page 58).

Employment

In total the members of EDANA who manufacture absorbent hygiene products employ some 100,000 people in Europe, making a substantial contribution to the economic wellbeing of families and communities in the countries of Europe. In 2005/06 some 20,000 of those were directly employed in the manufacture of absorbent hygiene products in Europe. This is matched by a similar number upstream within raw materials supplier industries, not to mention those employed downstream in logistics and commercial operations.

Figure 9 Member Company Regional Absorbent Hygiene Product Facilities



Key

- 1 Barcelona (HQ)
- 2 Jijona
- 3 Lisbon
- 4 Mequinenza
- 5 Montornés
- 6 Flintshire
- 7 Grandate
- 8 Pescara
- 9 Kunheim
- 10 Yeniköy - Izmit
- 11 Mulheim / Ruhr
- 12 Mulheim / Ruhr
- 13 Madrid (HQ)
- 14 Toledo
- 15 Düsseldorf (HQ)
- 16 Hallein
- 17 Pomezia
- 18 Wuppertal
- 19 Sezanne
- 20 Reigate (HQ)
- 21 Afula
- 22 Barton
- 23 Calatayud
- 24 Ovisan
- 25 Jaromer
- 26 Birmingham
- 27 Zele (HQ)
- 28 Eeklo
- 29 Istanbul
- 30 Turnov
- 31 Geneva (HQ)
- 32 Borispol
- 33 Budapest
- 34 Crailsheim
- 35 Euskirchen
- 36 Gebze
- 37 Manchester
- 38 Novomoskovsk
- 39 Schwalbach
- 40 Targowek
- 41 Aneby
- 42 Grimmenstein
- 43 Heidenheim
- 44 Herbrechtingen
- 45 Brück
- 46 Lièpvre
- 47 Israel
- 48 Milano
- 49 Munich (HQ)
- 50 Falkenberg
- 51 Gemerska Horka
- 52 Gennep
- 53 Hoogezand
- 54 Linselles
- 55 Olawa
- 56 Trescore Tremasco
- 57 Wasquehal

13. Conclusion

In this second edition of our Sustainability Report we have updated information and data about our products and sustainability considerations. We have sought to extend the amount of information available within the public domain about our industry and its impact on social, environmental and economic aspects of life in modern society. We believe such openness and accountability can only serve to improve decision making as it will help to better inform policy making and company actions.

This report has demonstrated that:

- absorbent hygiene products undoubtedly have contributed to social progress in terms of quality of life, comfort, convenience, reduction in household chores and skin health benefits;
- much is being done to improve the environmental performance of the production, use and disposal of absorbent hygiene products;
- today's products are made with both prudent and efficient use of natural resources, be it in the raw materials used in the products or the processes engaged to make them;
- the manufacture and distribution of absorbent hygiene products contributes in a variety of ways to the economies of the countries of Europe.

Absorbent hygiene products are an important, indeed essential, feature of modern day life in Europe and will continue to be so for the foreseeable future. Our industry is dynamic and creative. Through innovation and the application of state of the art technology, we will continue to respond to our consumers needs for safe and high performance products which are continuously improving. In this way the users of our products can be assured of even greater benefits in the hygiene, lifestyle and convenience attributes they have come to expect and on which they rely.

At the same time we will continue to optimize the efficiency of our resource utilization and to minimize the environmental impact of our processes. In relative terms our environmental impacts are small. Nevertheless we believe we must do everything we can to ensure that we reduce the impacts we make. We will continue as an industry to push the boundaries of our environmental achievements because we recognize that by doing so we will not only work towards the important longer term goal of sustainability, but it will also help us to meet the needs of our current and future consumers. In our individual company initiatives and through the work we undertake collectively as an industry, we will continue to look to:

- increase the efficiency of our use of natural resources;
- reduce the amount of waste we produce;
- reduce the amount of energy we use;
- reduce our fossil based CO_2 emissions.

We do not and cannot act alone. We need to work in partnership with governments at local, national and European levels as well as with consumer and environmental organizations and we welcome opportunities to do so.

Appendices

1. Glossary of terms

Absorbent core:	The central component of an absorbent hygiene product to which the fluid is transferred and in which it is then retained.
Absorbent hygiene products (AHPs):	Products designed to absorb bodily fluids through various stages of life. The market is segmented into three major areas: Infant and Child Care, Feminine Care and Adult Care. The products include baby diapers, training pants, pant diapers, sanitary pads, pantyliners, tampons, incontinence briefs, inserts and pads.
Acidification:	The process whereby air pollution – mainly ammonia, sulphur dioxide and nitrogen oxides – is converted into acid substances.
Acquisition/Distribution Layer (ADL):	The component of an absorbent hygiene product through which the fluid is transferred and distributed within the absorbent core.
Anaerobic digestion:	Anaerobic digestion is a biological process that produces a gas principally composed of methane (CH_4) and carbon dioxide (CO_2) otherwise known as biogas. These gases are produced from organic wastes such as livestock manure, food processing waste, etc. Anaerobic digestion reduces the odour and liquid waste disposal problems and produces a biogas fuel that can be used for process heating and/or electricity generation.
Back sheet:	The layer of an absorbent hygiene product made of either polymer film or nonwoven film designed to prevent wetness transfer from the wearer to their bed or clothes.
Bioburden:	The number and nature of microorganisms on a product.
Biodegradation:	The breakdown of materials by living organisms in the environment. The process depends on naturally occurring microorganisms, such as bacteria and fungi, which break down molecules for growth. For a material to be considered completely biodegradable, the parent material must disappear, substantial production of carbon dioxide (aerobic conditions) or methane (anaerobic conditions) must occur and there must be an absence of persistent metabolites (substances produced by biological processes).
Biogenic:	Produced by living matter.
Breathable:	Allows air circulation.
***Candida albicans*:**	Yeast like organism that can infect the mouth, the skin, the intestines or the vagina.

Cellulose wadding:	A soft, thick material made from cotton or rayon fibres.
Cellulose:	A natural polymer (macromolecular polysaccharide) that is the main component of plant cell walls.
Colony forming unit:	A measure of viable microorganisms.
Coverstock:	The outer layer of an absorbent hygiene product that is in direct intimate contact with the user's skin. It allows instant transfer of the fluid from the point of contact to the inside of the product. Sometimes also referred to as the topsheet.
Defibred wood pulp:	Wood pulp that has been put through a hammer mill to separate the fibres into 'fluff' which increases the bulk and, as a result, can be used to form AHPs.
Diaper dermatitis:	An irritation of the skin covering the groin, lower stomach, upper thighs and buttocks. Also known as 'nappy rash' in the UK.
Diaper:	Article worn by babies to absorb urine and contain faeces.
Disposable:	The term used by the Absorbent Hygiene Product industry to denote products intended for single use.
Dissolving grade wood pulp:	The technical name for fluff pulp.
Double-blind clinical study:	A clinical trial in which the method for analyzing data is specified in the protocol before the study has begun and the study subjects have been randomly assigned for either application of the study material or an alternative material, and in which neither the study subjects nor the physician(s) conducting the study know which treatment is being given to the study subject.
EDANA:	The leading association and voice of the Nonwovens and related industries. Its aim is to provide leadership through dialogue with stakeholders and the active promotion of sustainable development, consumer/ end-users interests and transparency.
Elemental Chlorine-Free (ECF):	A bleaching process that substitutes chlorine dioxide for elemental chlorine in the bleaching process. Compared to elemental chlorine bleaching processes, ECF bleaching reduces the formation of many chlorinated organic compounds.
Etiological factors:	Scientific factors.
Extrusion:	A manufacturing process that allows continuous production of polymer materials for example into long objects of a fixed cross-sectional profile.
Fiberization:	The separation of wood and other plant material into fibres or fibre bundles by mechanical (sometimes assisted by chemical) means.
Fluff pulp:	The common name for wood pulps used in the absorbent core of absorbent hygiene products such as diapers, feminine absorbent pads and airlaid absorbent products.

Global warming:	An increase in the average temperature of the Earth's surface, which occurs following an increase in greenhouse gases.
Good Manufacturing Practices (GMPs):	Good manufacturing practices (GMPs) are guidelines that describe the methods, equipment, facilities and controls required for producing safe products. They require a quality approach to manufacturing, enabling companies to minimize or eliminate instances of contamination, mix-ups, and errors.
HAPCO:	The Hygiene Absorbent Products Manufacturers Committee is run under the auspices of EDANA. It currently consists of 21 companies located throughout Europe who represent a dominant share of the production of disposable hygiene products: baby diapers, sanitary protection products and absorbent incontinence pads. It works closely with national industry associations representing the absorbent hygiene industry in European countries. The purpose of HAPCO is to present a clear understanding of disposable hygiene products and the benefits they offer to society.
Hot melt adhesives:	A solid thermoplastic adhesive that melts rapidly when heated and sets to a bond when cooled. Unlike many other adhesives, hot melt adhesives do not set due to the evaporation of a solvent.
In vivo:	In a living organism, as opposed to in vitro (in the laboratory).
Lamination:	Bonding sheets together.
Life Cycle Assessment (LCA):	A technique for assessing the environmental aspects and potential impacts associated with a product throughout its entire life cycle, from raw material acquisition through production, use and disposal. A LCA consists of four steps: goal and scope definition, Life Cycle Inventory analysis (LCI), Life Cycle Impact Assessment (LCIA), and interpretation.
Life Cycle Inventories (LCI):	The record of all inputs and outputs of the processes that occur during the life cycle of a product.
Lignin:	A naturally occurring component of plants that helps provide strength and that is generally removed during paper and pulp manufacturing.
Lipases:	Enzymes which are active in the digestion of fats.
Mechanical Biological Treatment (MBT):	The mechanical sorting and separation of the waste stream to separate the biodegradable materials, which are sent to a biological process, from the non-biodegradable materials which may be recycled or used for fuel.
Menarche:	The first occurrence of menstruation.
Menses:	The monthly discharge (bleeding) from the uterus of non-pregnant females from menarche to menopause consisting of blood, cervical mucus, cell residues and vaginal secretion.

Nappy:	Term used for a diaper in the United Kingdom.
Natural resources:	Substances extracted by man from the earth. Examples are iron ore, crude oil, water and wood.
Nitrogenous:	Of or relating to or containing nitrogen.
Nonwoven fabrics:	Sheet or web structures bonded together by entangling fibre or filaments (and by perforating films) mechanically, thermally or chemically. They are flat, porous sheets that are made directly from separate fibres or from molten plastic or plastic film. They are not made by weaving or knitting and do not require converting the fibres to yarn. They are suitable for products that have limited life or are single-use and specific functions including absorbency, liquid repellency, resilience, stretch, softness and strength.
Nonwoven substrates:	See "Nonwoven fabrics" above.
Nutrification:	The process of phosphorus enrichment causing over-enrichment of lakes and rivers with nutrients, leading to excessive growth of algae and other aquatic plants.
Occlusion:	A term indicating that the state of something, which is normally open, is now totally closed.
PET (Polyester):	Thermoplastic material that can be spun into fibres or continuous filaments. Its properties include strength and high modulus. It can be easily recycled.
pH:	A measure of the acidity or alkalinity of a fluid or substrate. The pH of any fluid is the measure of its range from 0 to 14 on a logarithmic scale, where 0 is most acid, 14 most alkaline and 7 is neutral.
Polyethylene film:	Thin plastic that comes in sheets of different thicknesses and sizes rolled or folded.
Polypropylene:	A thermoplastic material similar to polyethylene but somewhat stiffer and with a higher softening point (temperature).
Proteases:	Enzymes which cause proteins to break into peptides or amino acids (smaller pieces).
Raw materials:	Components of a product. Examples are fluff pulp, nonwoven fabrics and superabsorbent polymer.
Rayon:	A manufactured regenerated cellulosic fibre produced from naturally occurring cellulose.
Single-use product:	A product designed to be discarded after one use, also referred to as disposable.
Superabsorbent Polymers (SAP):	Granular crosslinked sodium polyacrylates used to absorb aqueous fluids, most commonly in baby diapers, adult incontinence products, external feminine hygiene products and other products in the personal care markets.

Superinfections:	An infection following a previous infection, especially when caused by microorganisms that have become resistant to the antibiotics used earlier.
Thermal treatment:	The treatment of waste in a device which uses elevated temperatures as the primary means to change the chemical, physical, or biological character or composition of the hazardous waste. Incineration is an example of thermal treatment.
Tissue wrap layer:	Used in some diaper products around the absorbent core structure or the storage layer. This serves to contain the dry structure during manufacture and assists in preventing distortion or collapse of the core when saturated with liquid.
Topsheet:	The outer layer of an absorbent hygiene product that is in direct intimate contact with the user's skin. It allows instant transfer of the urine from the point of contact to the inside of the product. Sometimes also referred to as the coverstock.
Totally Chlorine Free (TCF):	A virgin pulp bleaching process that uses oxygen-based compounds instead of chlorine-based compounds and chlorine derivatives.
Urea:	The end product of protein metabolism in humans which is discharged in the urine.
Valorization:	The capture of energy from incineration.
Viscose:	Alternative name for rayon.
Wood pulp:	Fibre from wood with varying degrees of purification that is used for the production of paper, paper board, and chemical products.

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