



Packaging



Wal-Mart Brazil
**Sustainability
Dialogues**

Building the Supply Chain
of the Future

WAL★MART *Brasil*



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Sustainable Packaging- a big challenge

PACKAGING IS PART OF HUMAN CULTURE SINCE VERY REMOTE TIMES AND IS INDISPENSABLE IN MODERN LIFE. HOWEVER, ITS BENEFITS WHICH PROVIDE PRACTICABILITY, AGILITY AND SAFETY, ALSO HAVE A COST JUST AS EVERYTHING ELSE WE CONSUME, A COST WHICH STILL HAS TO BE ACCOUNTED FOR AND ADEQUATELY REDUCED AS PART OF THE GLOBAL EFFORT IN SEARCH OF A MORE SUSTAINABLE SOCIETY.

THE SURVEY CARRIED OUT BY THIS STUDY SHOWS THAT WE ARE STILL FAR FROM MEETING THIS CHALLENGE. ACCORDING TO THE MINISTRY OF THE ENVIRONMENT, ABOUT ONE THIRD OF DOMESTIC GARBAGE IS MADE UP OF PACKAGING MATERIALS, OF WHICH ONLY 80% HAVE HAD MORE THAN ONE USE. INCLUDING THOSE DISCARDED BY INDUSTRY AND COMMERCE, IT IS ESTIMATED THAT THE LANDFILLS OF LARGE BRAZILIAN CITIES RECEIVE AT LEAST 25 TONS OF PACKAGING MATERIALS PER DAY.

FORTUNATELY THIS REPORT ALSO REVEALS THAT TODAY THERE IS ALSO, IN ALL SEGMENTS OF THE PRODUCTION CHAIN OF PACKAGING MATERIALS, A STRONG MOVEMENT TOWARDS IMPLEMENTING AND IMPROVING SUSTAINABLE PRODUCTION PROCESSES AS WELL THE MANAGEMENT OF POST-CONSUMPTION RESIDUES. THE SOLUTIONS WHICH ARISE THROUGH COMPANIES, UNIVERSITIES, RESEARCH INSTITUTES OR NGOS, REFLECT THE CREATIVITY AND CAPABILITY OF BRAZILIANS TOWARDS THIS PROBLEM.

TECHNOLOGICAL ADVANCES EMERGE SUCH AS “GREEN PLASTIC” OR THE PLASMA OVEN WHICH SEPARATES THE ALUMINUM FROM PLASTIC IN CARTON PACKS, NEW AND MORE SUSTAINABLE PRODUCTION PROCESSES ARE DEVELOPED, NEW APPLICATIONS ARE CREATED FOR DISPOSABLE MATERIALS AND REVERSE LOGISTICS FOR POST-CONSUMPTION PRODUCTS GROW RAPIDLY.

LASTLY, RECYCLING COOPERATIVES MULTIPLY, GENERATING WORK AND INCOME AND, ESPECIALLY, THE SO CALLED “GREEN CONSUMER” INCREASES EVERY DAY, WHO ADOPTS SUSTAINABLE PRACTICES IN HIS LIFE STYLE, AMONGST WHICH A PREFERENCE FOR PRODUCTS WHICH PRESENT INNOVATIONS CAPABLE OF GENERATING ENVIRONMENTAL GAINS, THE JOINING OF FORCES, THE “GLOBAL ALLIANCE” REFERRED TO IN THE EARTH CHARTER, INDISPENSABLE FOR OVERCOMING THE HUGE CHALLENGE OF OUR CIVILIZATION WHICH IS TO PRESERVE THE ENVIRONMENT FOR FUTURE GENERATIONS.

1. The Packaging Sector

1.1. AN ECONOMIC AND CULTURAL ACTIVITY

The origin of packaging is certainly as ancient as man's need to transport and protect his foods and products. And, most probably, its development was inspired on examples produced by nature, such as the complex and delicate protections which plants provide for their seeds, many of which were transformed by human beings into containers for liquids and foods.

Development of civilization resulted naturally in the ever more intensive use of packaging. Commerce, urbanization, the division of labor, forced man to incorporate it definitively into his daily life. From bamboo in Egypt, mud in Greece or from porcelain in China, up to the modern active packages which control the internal environment of the product, man produced true works of art in the form of baskets, pots, jars, bottles and other artifacts, giving rise to a cultural and economic activity which expanded in a diversified and complex manner up to the present day.

Protection is, and always will be, the basic function of packaging but this functionality goes beyond, adding important benefits such as helping to prolong

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Since ancient times, the production of packing created true works of art.

the product's shelf life, avoiding undesirable contact with foods, improving its presentation, increasing visibility of the product, facilitating transport, access to the consumer, educating or even seducing, transforming it into a great tool in the area of marketing.

1.1.1 Trends

1.1.1.1. *New technologies*

With the emergence of the industrial production mode, packaging went through its first great revolution not only due to the expansion of its market, but also due to the introduction of new technologies in its manufacturing process. Steel packaging, for example, suffered tremendous impulse with the industrial revolution, very quickly becoming the most used in the most varied segments. After the Second World War, plastics developed for warfare applications came into the market and inaugurated a new era in the sector. Its characteristics of malleability, lightness, impermeability and low cost among others, made the use of this product grow rapidly, affecting almost all segments of production until today.

1.1.1.2. *Consumer Profile*

Technological advances, added to rapid social transformations which occurred in the whole world as from the second half of last century, transformed the production of packaging into an extremely complex and sophisticated activity. In order to fulfill its objectives efficiently, they currently receive "the qualified participation of various specialists who are responsible for multidisciplinary activities required during its creation and production" such as "technicians, engineers, specialists in consumer behavior, among others", Professor Fabio Mestriner points out in an academic article of the post-graduate course in packaging engineering of the 'Escola Mauá de Engenharia' and coordinator of the Strategic Studies Committee of ABRE – (Brazilian Packaging Association).

These advances have allowed them to become appropriate to the product from the most varied points of view such as for example, creating an acclima-

CONSUMER PROFILE DEFINES THE PACKAGING	
CONSUMER PROFILE	TYPE OF PACKAGING
<i>Single, living alone, or families with specific habits</i>	<i>Small packages, practical, multifunctional and easy to store</i>
<i>Ageing population</i>	<i>Packaging for products with shorter shelf life, with ergonomic characteristics, safety, convenience and with clear and easy-to-read information and instructions</i>
<i>Healthy life style, demanding safety and hygiene</i>	<i>More complex packaging with greater transparency in the information, trustworthy materials, guarantee of inviolability</i>
<i>Ecological conscience</i>	<i>Biodegradable and recyclable packagings</i>
<i>Agitated daily life and under stress</i>	<i>Packaging with conveniences, re-usable and ready-to-cool</i>

tized micro-environment for vegetables and fruit. Mainly, however, they created the possibility of producing packaging according to the profile of each consumer group. Today they are capable of, for the same product, satisfying the needs of one person or of the whole family, they can be light and disposable for those who are in a hurry, practical and aseptic for those who eat their meals away from home, have special labels for people with special needs, inform and sell. And many packages continue to have value even after being used. Another trend resulting from globalization, is the adoption of international quality standards and costs, which helps to increase product competitiveness in world markets.

1.1.1.3 Nature's Turn

However, global development, the explosion of consumption, aggravated by the life style of present society, resulted in an undesirable impact on natural resources and environmental conditions of the Planet, obliging man to revisit his production and consumption standards. At this moment when the need for sustainability gains strength and reaches a world scale, the packaging sector is challenged to seek new viable and efficient solutions to reduce the impact of its products on the environment.



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With no reuse, discarded packs have an undesirable impact on the environment.

New trends are guiding packaging production towards the adoption of “production, consumption and reproduction standards which protect the regenerative capabilities of the Earth, human rights and community welfare”, such as expressed in UN’s Earth Charter launched in the year 2000, in Paris. The reduction in the utilization of natural resources and energy, the reutilization and recycling of discarded residues post-consumption, are words or order in these new times.

1.1.1.4 In favor of sustainability

Requirements of an environmental nature have been demanding, in addition to specific actions in critical areas such as a reduction in the emission of harmful gases, or the treatment of residues, integrated measures which affect the production chain of each item which reaches the market. It is essential that everyone involved work together, neutralizing their own impacts and contributing with sectors which depend on their actions.

In this scenario, the packaging sector has a prominent role. In addition to overcoming the impacts of its own production and of the residues produced following the use of its products, this sector has ahead of it the challenge of helping to reduce the impressive volume of losses of food and other goods which occur in Brazil and in the world. Brazilian fruit production, for example, “registers post-harvest losses which, in some cases, can amount to 40% of production due to the lack of packaging or of its suitability”, according to Clóvis Oliveira de Almeida, researcher of ‘Empresa Brasileira de Pesquisa Agropecuária’ (EMBRAPA). The situation in other sectors is not very different. Still according to EMBRAPA, between 20% and 50% of Brazilian agricultural production is lost in the entire distribution chain, between harvest and consumption. The development of packaging more appropriate to the product and to its distribution chain is fundamental in reducing the loss of goods. Academic works published by the FZVA magazine of the College of Zootechny, Veterinary Science and Agronomy of PUC/RS, analyses the causes of this waste of foods in Brazil and points out that “the perfect packaging of products with packaging materials which are appropriate to the product’s characteristics, is the first step towards minimizing these effects”, because they are present at the crucial stages of the product’s life – during transport, storage and display.

1.1.1.5 Legal requirements and technical standards

The infinite applications of packaging, especially in the food segment, have led the authorities to gradually regulate its production. There are various laws and technical standards regulating the sector.

As with all Brazilian standards, those concerning packaging, are prepared by ABNT, with the sector participating through the Brazilian Packaging Committee, created in 1982, and based in the Brazilian Packaging Association.

The standards help to standardize packaging, its raw materials and the tests applied to ensure its quality, aid in the exchange of information between manufacturer and its clients, protect human life and health, create a means of inspecting the quality of products and create an international standard so as to facilitate commercial interchange. Over one hundred standards have been prepared by the Brazilian Packaging Committee and many others are in progress.

The production of food packaging, because of the risk that these represent of contaminating the packaged product, must go through a very strict control in the whole of its process, from the choice of raw materials to the materials used in its finishing such as paints, labels, adhesives etc. To help in this task, the Toxicology Committee of ABRE prepared a Brazilian List of Exclusion of Raw Materials, Printing Inks and Related materials, which seeks to reduce potential health hazards. On adhering to the list, the company is committing itself to no longer use products such as solvents, thinners, plastifiers, drying agents and other listed materials when printing packaging for foods. Adhesion is voluntary and free of charge.

1.2. TYPES OF PACKAGING

Packaging materials are classified as rigid, semi-rigid and flexible, according to their consistency. Those that present some specific characteristic due to the type of product it contains or on its applications, are considered special packs. Rigid packs are produced in metal (steel and aluminum), glass, cardboard (flat and corrugated), wood, rigid plastics or ceramics, with the addition in some cases, of materials such as tinfoil, resinous or synthetic oils, paints and glues. Semi-rigid packs are plastic bottles and containers and mixed laminated materials.

Flexible packs are produced in plastic, aluminum foil, paper and regenerated cellulose, for use in some food products, personal hygiene such as shampoos, toilet soaps, deodorants and others. They are considered the most modern in the market and use sophisticated equipment in their production.

Special packaging has specific qualities such as impermeability to humidity, gases and ultra violet rays, protecting frozen products, are used for packaging products destined for individual or collective use, display originality, usefulness, and efficiency of the packaging, and heighten product qualities. Also special, are the modern active packs which help to prolong the shelf life of particular food products especially fruit, vegetables and legumes through the absorption of substances which facilitate ageing, and humidity controllers.

Packs may be further classified by basic type of raw material they use. Thus, they are grouped as metal packaging (iron? Or steel? and aluminum), glass, plastics, paper and cardboard, wood and cloth. Another common classification used in the sector, is that of the level of grouping of packages, divided into primary, secondary and tertiary. Primary packs are those whose contents are consumed and used by the end user on a daily basis, make direct contact between the product and the environment and carry information relating to the product and its producer. They may be grouped forming a secondary pack which facilitates handling and presentation and which protects the primary pack. In the distribution phase we find the tertiary packs with which products are shipped from their origin, from industries, passing through distributors and retailers and even in some cases, the final consumer.

WHERE PACKAGING COMES FROM

TYPES OF PACKAGING	RAW MATERIAL	PRODUCTS PACKAGED
<i>Carton packs (such as 'long life')</i>	Paper - produced from wood cellulose from planted forests (renewable source) + Polyethylene produced from petroleum + Aluminum – extracted from bauxite.	<i>Milk, juices and drinks</i>
<i>Bottles, flasks, pots, ampoules and glasses</i>	Glass – produced from sand, soda and lime	<i>Beers, wines, distilled drinks, fine beverages, cosmetics, perfumes and medicines. Preserves, jellies, instant coffee, soft cheeses, tomato extract.</i>
<i>Cartons, boxes, envelopes, bags, wrappers</i>	Carton paper, undulated cardboard and paper – produced from wood cellulose	<i>Flours, flakes, hamburgers. Shoes, electro-electronics, transport packing. Juices, drinks, long life, fruit, stationery, socks. Coal, manures, seed and rations.</i>
<i>Flasks, pots, bottles, bags, flow packs</i>	Plastic – produced from petroleum	<i>Cleaning and personal hygiene products, cosmetics. Soft drinks, juices, appetizers, macaroni, biscuits, ice creams and bonbons</i>
<i>Cans, blisters and seals</i>	Aluminum – produced from bauxite Steel – produced from iron ore	<i>Beers and soft-drinks. Medicines in strips, aluminum caps, preserves, oil and powdered milk. Paints</i>
<i>Boxes, crates and barrels</i>	Wood – product originating from vegetable biomass (renewable)	<i>Cigars, cod fish, vegetables, wines, distilled drinks, grapes and olives</i>
<i>Hemp and raffia bags</i>	Cloth – product of vegetable or petroleum origin	<i>Sugar, cereals and potatoes</i>

1.1.1 Production in Brazil

In Brazil, the packaging production chain is one of the most advanced in the world and covers practically the entire cycle, which goes from the extraction and production of the raw materials to the recycling companies, which operate post-consumption. This production system includes the petrochemical industry, paper and cellulose, extraction and transformation of minerals and wood, manufacturers of other materials, such as labels, caps, paint and glues, distributors and suppliers of the production systems (machines for packing products) and manufacturers of equipment and moulds.

According to data from the Getúlio Vargas Foundation (FGV) disclosed by the Brazilian Packaging Association (ABRE), the sector invoiced R\$ 36.6 billion in 2008, compared to R\$ 33.5 billion in the previous year, representing an increase of 9.25%. Global production of these industries however, ended last year with a drop of 0.61%. Packs made from wood showed a decrease of 12.20%, glass showed a reduction of 3.85% and metal fell by 3.52%. Paper, cardboard and carton paper industries ended the year with an increase of 2.06% and plastics produced a growth of 0.59% in its production.

The plastic packs industries showed the main participation in total production with a share of 37.64% or R\$ 13.8 billion. Corrugated cardboard and carton paper were placed second with a 28% participation (R\$ 10.3 billion) followed by metal packs with 16.94% (R\$ 6.2 billion), paper with 7,2% (R\$ 2.6 billion) and glass with 5,23% (R\$ 1.9 billion).

The sector also showed a slight growth in the number of direct and formal jobs in 2008, closing the year with a total of 197,249 active working posts. The level of employment reached 202,608 posts in October of last year. The greatest reduction occurred in December with a net reduction of 3,692 jobs.

The modern packaging industry developed distinct production segments, based on the raw materials used. Each segment operates within defined production and market structures, attending to the needs

of usage and offering barriers for the protection and preservation of specific products.

1.3 PLASTIC PACKS

Plastic, a material derived from petroleum, presented great advances in its development during the Second World War when it was used not only in warfare materials, airplanes, vehicles, as well as in backpacks, clothes and utensils, making them lighter, waterproof and practical for the conditions encountered by the troops. After the war, it gained the most varied applications so that today, it seems indispensable for modern life.

The introduction of plastic in the packaging sector brought about important transformations in this market, not only in its production lines but also in its forms of utilization, in design, in transport and in many other aspects. The apparent consumption of plastic in Brazil, measured by the sum of the volume produced, plus that of importations, less the volume exported, exceeded 5.2 million tons in 2008, including the resins Polyethylene (PE), Polypropylene (PP), Polystyrene (PS), Polyvinyl Chloride (PVC), Polyethylene terephthalate (PETE), Ethylene-vinyl acetate copolymer (EVA). Plastic is today the main raw material and accounts for 37% of the total revenue of the sector. The types of plastic most used in the production of packaging are PETE, HDPE, PP, Ps and PVC.

1.3.1 PET has become synonymous with bottle



Polyethylene terephthalate (PETE) is used mainly in the production of bottles for soft drinks and mineral waters.

It has special characteristics for this application such as low cost, lightness and resistance to impact, as well as performing the same role as glass bottles in protecting the content and not permitting gas to escape.

Packaging produced with PETE is 100% recyclable and Brazil is one of the largest recyclers of this material in the world. Even so, a large quantity is lost in landfills or is carried away by rain causing pollution of water

reservoirs. They are identified by the number 1 inside the triangle symbolizing recycling, almost always on the underside of the bottle.

1.3.2 High density polyethylene (HDPE)



High density polyethylene (HDPE) is a type of thermoplastic derived from ethylene which presents high resistance to impact, also at low temperatures, as well as good resistance against chemical agents. It therefore has wide application in the packaging sector. It is one of the types of plastic introduced commercially after the Second World War and is currently the fourth most sold in the world. It is also the second resin most recycled in the world.

HDPE in its form without pigments is used in packaging of foodstuffs such as bottles of dairy products, mineral water and fruit juices. When it is pigmented, it is used in higher volume bottles for clothing detergents, hygiene and cleaning products, whiteners, motor oils. When processed by extrusion, it generates films for the production of plastic bags used in supermarkets. The packaging sector represents 75% of the world market for HDPE.

1.3.3 Vinyl Polychloride (PVC)



PVC employs in its composition, 57% of chlorine extracted from marine salt, as raw material. The remaining 43% is obtained from ethylene, derived from petroleum. It is a versatile material with rigid or flexible applications but it has a low application in the packaging sector. It is highly used in civil construction. PVC is recyclable but still has a very low index of re-utilization.

1.3.4 Low Density Polyethylene (LDPE)



Low density Polyethylene (LDPE) is derived from ethylene, very light and flexible but very resistant. It is employed in the packaging of foodstuffs, especially in automatic packaging, industrial bags, garbage bags, flexible films, agricultural sheeting, handbags, flasks for cosmetics, medicines and food.

1.3.5 Polypropylene (PP)



Polypropylene is produced from propylene gas which is a sub-product of refining crude oil. It is characterized by its higher resistance to chemicals, can be welded and is easily molded, in addition to being the lightest of plastics. It is much used in the packaging sector for the molding of caps, small bottles, labels for soft drink bottles, pots of margarine, medicines, chemical products and bagging material (raffia).

1.3.6 Polystyrene (PS)

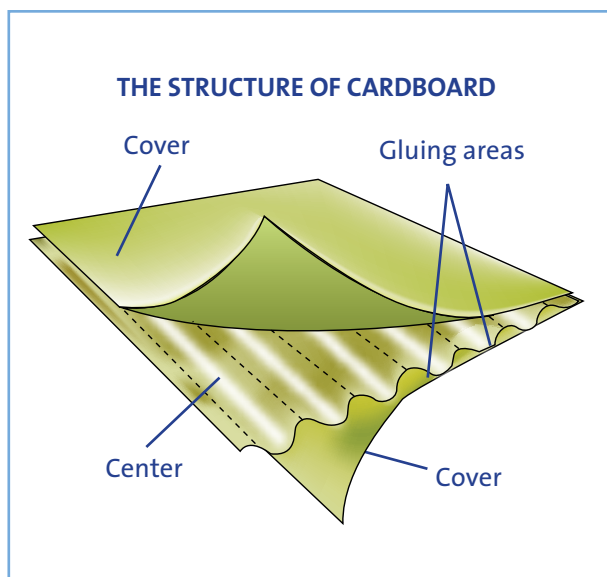


Polystyrene (PS) is also a plastic which can be easily molded under the effect of heat. However, it is hard and brittle with great transparency. In the packaging area it is used in its transparent form for disposable drinking cups and in the form of foam for the production of insulating containers for food, boxes for eggs, etc.

11.4. PAPER AND CARDBOARD PACKAGING

Paper and cardboard packaging currently represents 34% of the market's revenue and is used in most sectors of the economy. They are the most simple and cheapest packs in the market, covering from paper bags and wrapping paper, to boxes and plain cartons made of plain or undulated cardboard. They can be molded into various formats, are relatively light and occupy little storage space. The corrugated cardboard box is made of various combinations of papers which make up the cover and the center – cover-paper and center-paper. They are considered the package of packages and are therefore the thermometer of the economy. In 2007 over 4.4 million tons of paper and cardboard packages were produced in Brazil.

In 2008, corrugated cardboard packages amounted to 2,274.13 thousand tons, an increase of 0.88% over 2007, according to the Brazilian Corrugated Cardboard Association (ABPO).



1.5. METAL PACKAGING

The metals used in the packaging sector are aluminum and steel. These materials were market leaders in the industrial era until the appearance of plastic, with applications in the most diverse sectors and, today, still represent 21% of all packaging, losing only to plastic, paper and cardboard. Metal has as its principal attributes the capability of increasing the shelf life of products, preserving its properties well and a resistance to impacts. Metal packaging is infinitely recyclable.

1.6. STEEL PACKAGING

To this day, steel packaging is considered one of the most efficient, since it avoids waste and properly protects the integrity of its contents, especially during transport and marketing. In addition to being resistant, it is versatile, facilitates displaying the products on shelves, can be made into a give-away for the consumer, is totally recyclable and preserves the nutritional properties of food for a long time.

During long distance transport or under critical conditions, for example, the steel pack is the first to be considered due to its mechanical resistance. After the introduction of new technologies, one of its greatest inconveniences – its weight –, has been minimized

by reducing the thickness of steel sheets which currently can get down to 0.14 millimeters.

Steel packs are widely used in the food sector for products such as edible oils, powdered milk, condensed milk and cream, fish products, preserves, sweets, tomato products and drinks. It also has wide application in products such as paints and varnishes, promotional materials, aerosols, cosmetics, chemical products, batteries, pet food among others.

1.7. GLASS PACKAGING

Glass is one of the most ancient materials used in the production of packaging and in Brazil it represents, today, a 7% share of the market. It presents various qualities: it is inert to chemicals, neutral, capable of being molded, protects the characteristics of the product it contains and allows for sophisticated decorations, adding value as packaging for food, fine beverages, perfumes, among others. It is also used to contain chemical products, can be washed and re-used. The majority of types of glass are 100% recyclable and they do not suffer any loss of quality or purity. In many cases, the glass package is returnable.

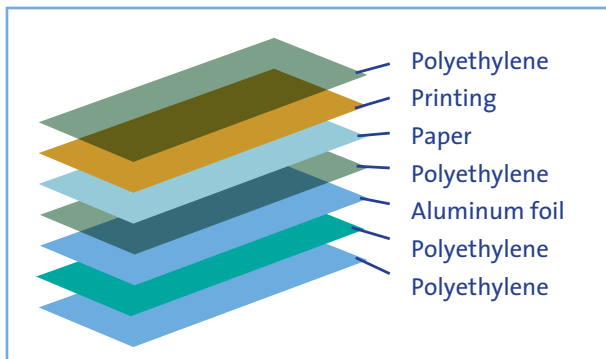
1.8. WOODEN PACKAGING

Wooden packaging has a 2.4% slice of the market which is equivalent to revenues of almost R\$ 900 million in 2008, according to a survey of the Brazilian Packaging Association (ABRE). Although it has occupied a place of prominence in the packaging sector, after the appearance of plastic, wood has been consistently losing market share. Today this material, produced from renewable raw materials and perfectly recyclable, occupies a niche in special applications especially in the segment of primary packaging such as pallets and large boxes for transporting products over long distances, returnable packaging for horticultural products and fruit, barrels for beverages and special small packages.

1.9. CARTON PACKAGING

Carton packaging for long life products was launched in the 70's by Tetra Pak and attends more specifically the food industry (milk and juices, tomato sauces, mayonnaise, etc.). It is made in three layers composed of three types of materials: paper (carton), plastic (low density polyethylene) and aluminum.

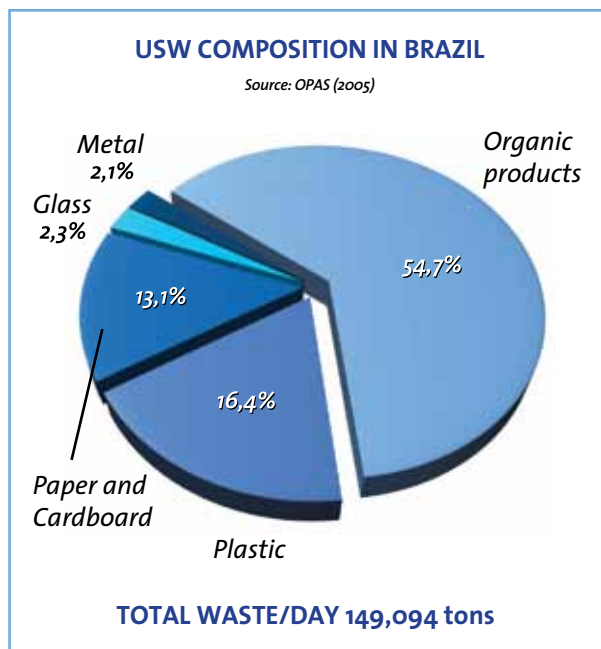
Source: Tetra Pak



These materials create a barrier which prevents the entry of light, air, humidity and microorganisms, as well as preserving the aroma of the food. The protection against light and oxygen has the objective of avoiding natural processes such as oxidation of important nutrients such as vitamins, especially in the case of milk and fruit juices. These conditions permit that the content of the pack be preserved for many months, without the need for the addition of artificial preservatives or refrigeration.

2. The environmental impact of packaging

Data on the generation of solid wastes in Brazil is still scarce and what is available is either old or incomplete, which raises difficulties for the safe sizing up of the impact caused by discarded packaging. According to the Brazilian Institute of Geography and Statistics (IBGE), 161.8 thousand tons of solid wastes were collected daily in the country during 2002, of which 125 thousand were of domestic origin. The per capita generation of waste during that year was 0.95 kg. per inhab. per day, and varied according to the city population from 0.45 to 1.3 kg. per inhab. per day. However, the 2003 Analytical Diagnosis of Solid Waste Management in Brazil, issued by the Pan American Health Organization (OPAS), indicated an amount of 149,094 tons of waste collected daily, of which 57.4% were organic material, followed by plastic (16.4%), paper and cardboard (13.1%), glass (2.3%) and metal (2.1%).



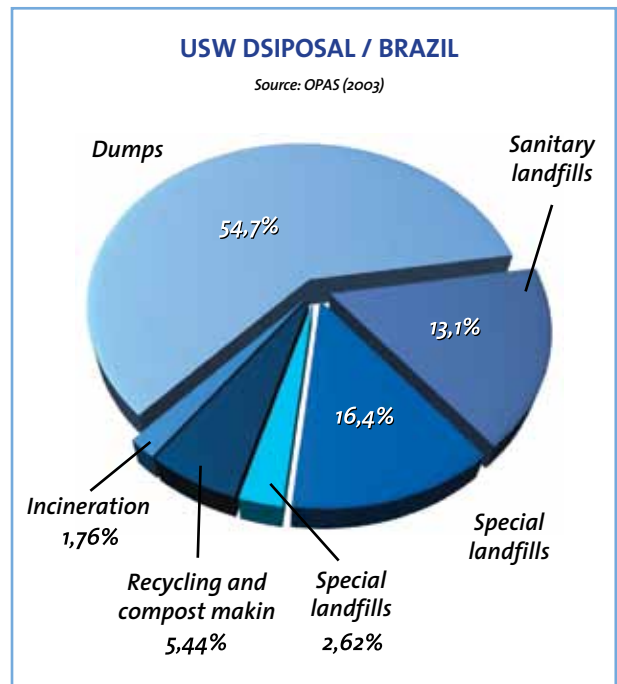
Packaging is an important contributor to the generation of waste that will end up in municipal landfills. In European Union countries, the solid waste related to packaging represents 17% of the total weight of waste generated in their cities, according to 2007 data disclosed by the Confederation of the Food and

Drink Industries of the European Union. In 1997, the total solid waste generated from packaging in the United States amounted to 71.9 million tons, that is, 33% of the total waste produced in North American cities. (HELLER KEOLEIAN, 2000).

The Ministry of Environment estimates that 20% of the domestic garbage is made up of discarded packaging, which represents 25 thousand tons daily. Out of this volume, about 80% is discarded after a single use. Considering the low recycling indices in the country, with the exception of aluminum cans as we will see later, the inadequate disposal of packaging has been exercising a great impact on solid waste management in urban centers. The lack of regulation and investment induced Brazil to suffer a delay in the management of its urban solid waste. Sanitary landfills receive a very small share of the waste generated, in spite of representing an efficient alternative for its correct management, further to generating additional benefits such as power generation and the reduction of gas emissions into the atmosphere.

According to OPAS, in 2003, nearly 60% of the total urban solid waste collected in Brazil (59.03%) were destined to large dumps, 16.78% to controlled landfills, 12.58% to sanitary landfills and 2.62% were disposed of in special landfills. Only 5.44% were destined to recycling and composting and 1.76% to incineration. According to data collected in 2006 by the Ministry of Cities in 247 big-sized cities that concentrate nearly 50% of the national population, the situation is starting to change. The Diagnosis of the Municipal Solid Waste Management detected that 61% of the garbage collected are destined to sanitary landfills. The controlled landfills – which have a better organized structure than the large dumps, but are still dependent upon the work of garbage pickers - receive approximately 25% of the garbage; whereas the large dumps account for 13.6% of the material collected.

However, in addition to the direct environmental impact, we have to consider other losses resulting from the low recycling index, such as, the energetic potential waste, increased emissions and the higher consumption of natural resources to produce new



packaging. However, this is a complex estimate, considering the long production chains existing in most manufactured products, which demanded the adoption of a specific index obtained from the Life Cycle Assessment (LCA). The LCA methodology is adequate to study the interaction between product and environment, as well as to evaluate the potential impacts associated to it all over its chain (from the extraction and production of raw materials up to their final elimination). These studies are currently essential for companies in order to introduce adequate management strategies for the management of the impact generated by their production.

2.1 PLASTIC PRODUCTION IMPACT

Data from a Getúlio Vargas Foundation survey conducted for the Brazilian Association of Packaging on the performance of the packaging industry in 2008 shows that plastic is the most widely used raw material, accounting for a share of 37.6% of the market sales. For the same reason, it is also the most abundant material in landfills and dumps in the country, accounting for 16.4% of the total solid waste and second only to the organic material (54.7%).

According to data disclosed by the Entrepreneurial Commitment for Recycling, (CEMRE), about 21.2% of rigid plastics and film were recycled in 2007, in Brazil.

According to Abiplast, Brazilian companies produced 5.14 million tons of thermoplastic resins in 2008. A growth of 5.3% as compared to 2007. According to the association, the apparent consumption amounted to 5.29 million tons, a growth of 6.8% in the year. Abiplast estimates that out of the total consumption of plastic in Brazil, 14.5% is destined to packaging manufacturing, corresponding to 768 thousand tons. In view of the low indices of plastic recycling in Brazil, as shown below, and of the lack of policies and adequate management of solid waste actions, this material is among those that cause the highest impact on the environment.

The aquatic biomes are among the most severely disturbed by the inappropriate disposal of solid waste. The Ministry for the Environment estimates that plastic waste is responsible for the annual death of over one million birds and 100 thousand marine mammals in the world. According to the British newspaper, The Independent, a huge area in the North Pacific would be seen as a giant “garbage patch”, covering an area twice the size of continental United States. The area known as North Pacific Gyre is where the ocean circulates slowly because of the lack of wind and extremely high pressure systems that cause the garbage to accumulate. It is believed that about 100 million tons of flotsam are circulating in the region. About one-fifth of the refuse may have been thrown off oil platforms or passing ships. The remainder comes from land.

The inappropriate disposal of packaging contributes to the depletion of landfills and dumps, hinders the degradation of other wastes, is eaten by animals causing their death, pollutes the environment, causes problems to power systems and many other less noticeable environmental impacts such as the increased demand for the production of new packaging, thus leading to the consumption of additional natural resources and the generation of more waste.

MATERIALS DECOMPOSITION	
MATERIAL	DECOMPOSITION TIME
Paper	From 3 to 6 months
Fabric	From 6 months to 1 year
Metal	Over 100 years
Aluminum	Over 200 years
Plastic	Over 400 years
Glass	Over 1000 years

Source: Education Manual – Sustainable Consumption - MMA and IDEC

2.2 IMPACTS FROM PAPER PRODUCTION AND CELLULOSE

In order to obtain the cellulose paste, that is, the basic raw material for paper, it is necessary to plant thousands of hectares of forests and occupy vast areas of cultivable lands, mainly in regions where the agricultural frontier expansion no longer exists, thus provoking an important impact on the environment. Two to three tons timber are required to produce one ton of paper.

According to the Brazilian Institute for Consumer Protection (Idec), the production of pulp and cellulose in Brazil utilizes raw material exclusively originating from reforestation areas, mainly eucalyptus (65%) and pinus (31%) trees. While the use of planted forests can be translated into benefits such as the preservation of natural areas and the creation of biomass, “it provokes negative impacts in view of the loss of biodiversity and the occupation of extensive areas with scarce job offers”, explains Lisa Gunn, environmental consultant for the Institute.

Paper production also demands high consumption of water and power. It ranks fifth place among the most energy-consuming activities. Water consumption is so high that it may endanger the availability of this resource for other activities. According to Daniela Meirelles Dias de Carvalho, a geographer and technician at Fase, a non-governmental organization that carries out its activities in a social-environmental area in the northern region of the state of Espírito Santo, eucalyptus plantations initiated in the ‘60s have already dried out over 130 streams.

The Brazilian Institute for Consumer Protection warns that the use of highly toxic chemicals to separate and bleach the cellulose pulp also poses a serious risk to human health and to the environment, because it endangers the quality of water, soil and food. According to the Institute information, even after the treatment of effluents, the still remaining toxic substances are thrown into rivers, thus contaminating water, soil, vegetation and animals.

The accident risk in cellulose and paper industrial complexes represents a threat to the environment and surrounding communities. A specific example occurred a few years ago in Cataguazes (MG), where a reservoir for effluent treatment belonging to Cataguazes Paper Mill collapsed and toxic chemicals leaked out. The spillage of about 1.2 billion liters of toxic waste into Cágados Stream flowed into the Pomba and Paraíba do Sul rivers and implied that 600 thousand inhabitants in eight municipalities had no water supply; fish died and fishermen and river-bank communities were left without their main staple.

2.3 STEEL PRODUCTION IMPACT

Steel is a metal alloy made up of iron and carbon. The raw materials from which steel is made are iron ore, mainly hematite, and coke which does not occur pure in nature. Pig iron is produced from these two materials, after going through processes that have a high impact on the environment, with great consumption of water and power, emission of greenhouse effect gases and of solid particles into the atmosphere.

In Brazil, pig iron producers use charcoal, which renders the production theoretically less aggressive to the environment in comparison with coal, which is a fossil fuel. The problem is that the replacement for charcoal, from planted forests origin, in spite of presenting a relative advantage, does not eliminate the negative effects like land concentration, intensive use of pesticides, decrease in biodiversity and reduction of the area available for food crops.

According to the Ministry of Mines and Energy, pig iron and steel industries utilized nearly 10% of the

total power consumed in the country in 2006. Carbon dioxide (CO₂) and methane (CH₄) are among the gases generated by that activity that contribute to the increase of carbon in the atmosphere and consequently, to climatic change, other gases generated are sulfur oxides (SO_x) and nitrogen oxides (NO_x), which account for the so called acid rain. There are also organic pollutants, some of which may cause several types of cancer.

Liquid effluents generated by steel production have a high concentration of contaminants, such as ammonia, benzene, oils, copper, lead, chrome and nickel. The report "O Estado Real das Águas no Brasil", developed by Defensoria da Água, indicates that in spite of steel producers' own effluent treatment plants, two steel mills are among the five most polluting companies in the country.

2.4 ALUMINUM PRODUCTION IMPACT

Aluminum cans were introduced in Brazil in the late '80s and quickly captured the market. It was such an amazing success that 13.3 billion cans were consumed in the country in 2008, which represent an annual per capita consumption of 70 units, or more than five units per month per Brazilian citizen. In order to produce that amount of cans it was required nearly 180 thousand tons of aluminum, a metal that is not found free in nature.

Five tons of bauxite are necessary to produce a ton of primary aluminum and its extraction occurs in open mines, which requires the complete removal of the vegetation and of the soil upper layer. Therefore, the activity causes serious damages to forest, fauna and soil. In Brazil, one of the largest aluminum producers in the world, the activity is concentrated in the Northern region, thus affecting the Amazon rainforest.

The aluminum industry requires a high investment in measures of neutralization and mitigation of its environmental impacts, such as, rehabilitation of the forest coverage, destination of highly toxic waste and contaminants generated by the activity and control of air pollution and superficial or underground water sources.

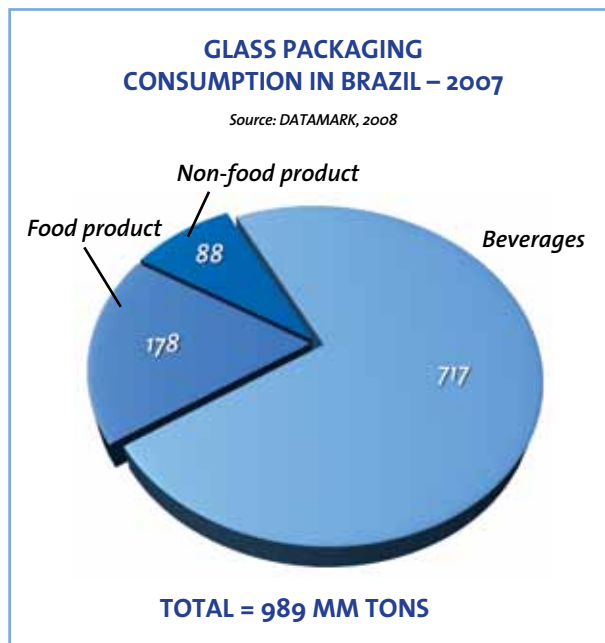
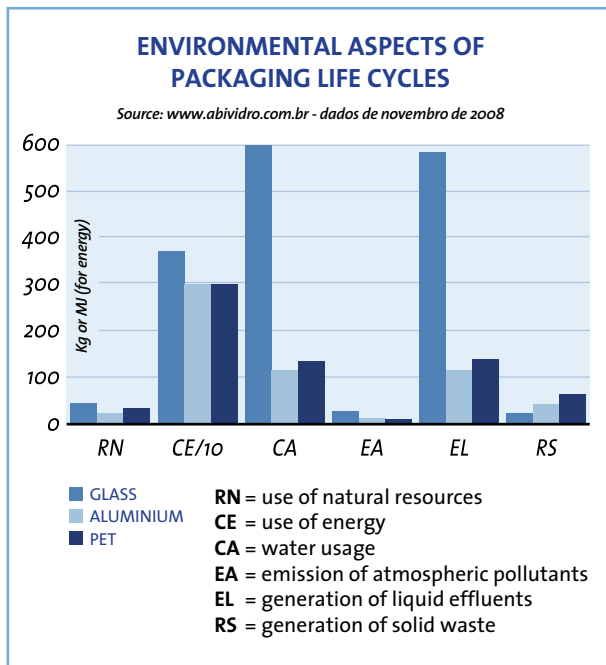
One example of the difficulties faced by the industry is the destination of the so called “red mud”, resulting from bauxite washing and filtering which is highly caustic and made up of elements like insoluble ferrous oxide, titanium, sodium and silica, among others. This waste is normally disposed of in already mined areas. From there on, the waste can flow to ground water deposits and streams, thus increasing the sodium content of water sources. The several phases of the production process release gases, caustic sprays, sulfur dioxide and sulfur trioxide responsible for acid rain.

2.5 GLASS PRODUCTION IMPACT

The glass industry also causes a strong environmental impact. Over 90% of glass manufacturers use sand, soda ash and limestone for raw materials extracted from nature. The manufacturing process is based on the heating and fusion of those materials at high temperatures, which generates decompositions of hydrates, carbonates, nitrates and sulfates that unloosen themselves in the form of water vapor, carbon dioxide, nitrogen oxides or sulfur oxides.

Analyses of Life Cycle Evaluation show that, in relative terms, the major consumption of natural resources occurs in the life cycle of glass bottles, 2.18 and 1.40 times above that consumed in the life cycle of aluminum cans and PET bottles, respectively. The consumption of water in the life cycle of glass bottles is 4.69 times above that consumed in the life cycle of PET bottles. As far as power utilization is concerned, it is also in the life cycle of glass bottles that the major consumption occurs, which is 1.29 and 1.31 times above the power consumption in the whole life cycle of aluminum cans and PET bottles, respectively.

The emission of atmospheric pollutants is 4.48 and 3.23 times above the life cycle of glass bottles, as compared to the life cycle of aluminum cans and PET bottles, respectively. The life cycle of glass bottles shows the greatest generation of liquid effluents, which is 4.54 and 3.59 times above the life cycles of aluminum cans and PET bottles, respectively. In 2007, the Brazilian glass market sold R\$ 3.85 billions, out of which R\$ 1.35 billion in packaging, which accounts for 35.1% of the industry sales.



2.6 WOOD PRODUCTION IMPACT

Wood packaging materials are produced from sawn timber, surfaced lumber, plywood boards or agglomerates, resulting from pinus and eucalyptus reforestation or from natural forests, especially in the Amazon region. The impacts of this wood production with great importance in the packaging Life Cycle Evaluation, are studied considering the three origins of the raw material: planted forests, forest management areas and illegal exploitation of natural timber.

Planted forests' growing importance is due to their role in the neutralization of greenhouse effect gas emissions attributed to their capacity of capturing carbon. The more forests planted, even though rotation plantations, for wood production purposes, the more efforts will be aggregated to reinforce the fight pro neutralizing global warming. Nevertheless, reforestation has impacts that should be taken into account, such as, decrease in biological diversity, contamination by agricultural pesticides and occupation of an area otherwise usable for food crops.

The management of natural forests for timber exploitation has an advantage over reforestation, which is a better preservation of the forest biodiversity. However, it also causes damages to the forest, considering that in this kind of exploitation, tree cutting is selective, demanding the opening of glades and roads to extract the timber. In addition, the land use control represents a serious problem and is responsible for most of the clandestine deforestation in Brazil. Anyhow, it is important to stress that, theoretically, the intensive use of timber from reforestation or forest management brings about the benefit of formation or preservation of biomass that can carry out carbon capture in the atmosphere, contrarily to what happens with the manufacturing of other packaging raw materials.

Furthermore, wood packaging manufacturing presents the lowest environmental impact in comparison with other types of raw materials, For instance, it is low power consumer, makes use of practically all its production wastes, including power generation, promotes a more intensive occupation of la-

bor resources and generates few effluents or easily treatable effluents. Furthermore, wood packaging is impact resistant, offers a low cost and quick biodegradation in case it is discarded in the environment.

2.7 CARTON PACKAGING IMPACT

The use of carton packaging is growing in Brazil since its launching, in an average pace of 5% per year. In 2008, Tetra Pak introduced nearly 10 billions of long life packaging into the market. Out of that total, only 26.6% were recycled and became raw material for other products, in accordance with the manufacturer. The remaining packaging was disposed of in the environment, causing the same impact as paper, plastic and aluminum – its constituent materials – in the urban solid waste management. Furthermore, it is necessary to aggregate other costs normally accounted by the Life Cycle Evaluation of the product, such as wastes of power, raw material, industrial residues and water consumption in all phases of the productive chain.

3. Neutralizing or minimizing impact

The concerns on the impact on the environment resulting from packaging wastes caused the various segments involved in the production chain to find solutions for neutralizing or reducing such impact. Researchers of packaging engineering and related areas such as materials engineering, productive systems, design, transportation, logistics, specialists in consumption and others, began to see the concept of sustainability as the focus of their research work, producing a set of important innovations, many of which have already been implemented, as can be seen below.

The axis of the advances obtained follows the principle of the “three r’s”, as expressed in the Earth’s Charter: The reduction in the use of natural resources and energy, the reuse and the recycling of waste residues after use. Considering the golden rule of environmentalism, the “three r’s” have the quality of being easily applicable in activities which range from the most simple to the more complex. When speaking of reducing, one speaks not only of everyday actions such as saving one’s bath water, but also of sophisticated technologies such as calculating the ideal relationship between the volume of the packaging and its contents. In the same way, reusing and recycling apply both to everyday PETE and to the plasma oven, which separates the plastic and the aluminum in cartoned packaging.

3.1 REDUCTION AT THE SOURCE

The reduction in volume of raw material employed in the making of packaging is one of the main mitigating measures of environmental impact in that activity. Several solutions have been applied in order to achieve this goal. Refills, for example, enable a considerable reduction in natural resources involved in the process. The user purchases a product for the first time in its appropriate use packaging and, later, needs to purchase only the contents in simpler and more economical packaging, reducing not only the

raw material but also the consumption of water, energy and other resources required for the manufacture of packaging for use. The measure promotes the other ‘r’, when reusing an initial packaging, reducing its disposal. Included under the same principle, packaging containing concentrates which are diluted directly by the consumer in his/her home.

The reduction principle may be applied to any type of raw material, with a larger impact capacity over those with higher environmental costs, such as plastics, metal and glass. In this way, specialists in packaging design, for instance, began to project environments with all these materials, enabling them to contribute in some way to the reduction of non-renewable resources. A slight reduction in volume in the design of a packaging can mean significant reductions in use of raw material in the production of millions of these.

One of the disadvantages of glass packaging, its weight, is being gradually reduced by means of new technologies which allow a reduction in volume of the raw material employed, saving energy and water, especially important for the glass industry. During the past 20 years, the average weight of the plastic packaging in general has diminished by some 50%, reducing the impact of their disposal in sanitary disposal sites. The emergence of more durable and improved quality plastics increased the rate of reuse of used packaging.

MORE PRODUCT PER SQUARE CENTIMETER OF PACKAGING

Proctor & Gamble has experimented, in Germany, a reduction in materials used for the production of fabric softener, altering its packaging and the form it is marketed. It began to offer the product in concentrate form, together with an empty reusable bottle where the consumer prepares the dilution required for her use of the softener. The company states that, through this effort, it has reduced packaging production for the product by 90% and attributes the success of this project to the Eco-friendly attitude of the German consumer.

3.2 RECLAIMING OR REUSE

Reclaiming or reusing is a reintroduction effort in the production process of products already used, thus avoiding their disposal in landfills. Reclaiming occurs when the product does not undergo any alteration or complex processing. Some kinds of packaging are easily reused. Turning a bottle into a vase or using an old shirt as a floor cloth are examples of reuse. It is a practice that produces good results in activities connected to creativity, such as handicrafts, the making of rustic furniture, among others.

3.3 RECYCLING

Recycling allows the reclaiming of residues that may be reprocessed, in a production process, resulting in a new product. Of the three principles, recycling is the option that may generate the highest impact in a shorter period of time. The advantages of recycling plastic, for example, are great. The recycled product saves 70% of the energy used up throughout the production chain for that material. An important savings for the reduction of global heat generation. The three main kinds of plastic recycling are: mechanical, chemical, and energy recycling.

3.3.1 mechanical recycling

Through mechanical recycling the plastic material discarded after-use is transformed into granules which may be reused for the production of other products such as trash bags, footwear soles, flooring, conduits, hoses, automobile components, fibers, non-food product packaging and many others. It is estimated that, in Brazil, 15% of plastic residues are mechanically recycled after use.

3.3.2 chemical recycling

Chemical recycling is done through the reprocessing of plastic items, transforming it into a basic petrochemical product, which serve as raw material in refineries or petrochemical plants for manufacturing products of the highest quality. The objective of chemical recycling

is to salvage individual chemical components in such a way as to allow them to be reused in the production of new plastics with the same quality as the original. This recycling brings about several advantages for the industry. However, this is complex and demands mastery of sophisticated technology besides being expensive for large scale operations.

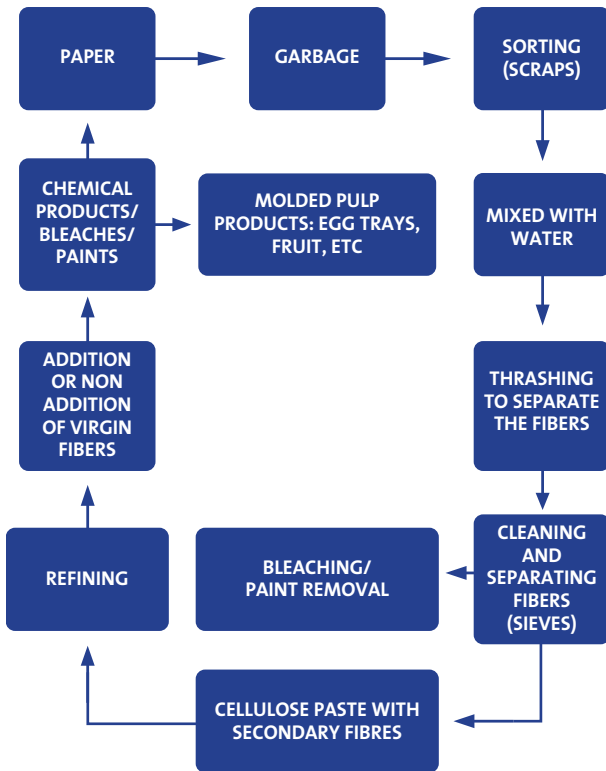
3.3.3 energy recycling

Energy recycling allows the salvaging of energy contained in plastics through thermal processes. That is to say, residues from plastics are used as fuel in thermal-electric plants. The energy contained in 1 kg of plastics is equivalent to that contained in 1 kg of crude oil. Approximately 15% of plastics recycling in Western Europe is done through energy recycling.

PETE RECYCLING IN BRAZIL	
YEAR	RECYCLING after-use/rate
1994	13 Ktons = 18.8%
1995	18 Ktons = 25.4%
1996	22 Ktons = 21.0%
1997	30 Ktons = 16.2%
1998	40 Ktons = 17.9%
1999	50 Ktons = 20.42%
2000	67 Ktons = 26.27%
2001	89 Ktons = 32.9%
2002	105 Ktons = 35%
2003	141.5 Ktons = 43%
2004	167 Ktons = 47%
2005	174 Ktons = 47%
2006	194 Ktons = 51.3%
2007	231 Ktons = 53.5%

According to Abipet, in 2007, at least 184 thousand tons of PETE bottles were discarded in the garbage, out of a total of 415 thousand tons produced.

Source: Associação Brasileira da Indústria do PET (Abipet)



3.3.4 Paper and cardboard recycling

The recycling of paper / cardboard is extremely important, even though it is biodegradable material. Among the benefits generated by its recycling, the savings in natural resources, the reduction of production costs, water consumption, energy use, and pollution stand out. In order to illustrate this, the use of a ton of scrap, in recycling, could replace from 2 sq m to 4 sq m of wood, depending on the type of paper to be manufactured, which is equivalent to some 15 to 30 trees.

Paper recycling plants are able to reduce an important part of the impact on the environment of paper production, since they eliminate the most critical phase in the original production phase, which is the production of cellulose. Additionally, recycling is able to generate five times more jobs than paper production from virgin cellulose and ten times more jobs than the collection and final disposal of garbage.

In Brazil cardboard has been recycled for many decades and has reused more than 1.6 million tons of old paper scraps per year. According to the Brazilian Association of Corrugated Cardboard (ABPO), the recycling rate of corrugated cardboard packaging in Brazil totaled 77.4% in 2007 which places the country at the rank of recyclability similar to that registered in the main developed countries.

Recycled paper may be applied in cardboard boxes, carrier bags, egg cartons, trays for fruit, toilet paper, notebooks and books, office material, envelopes, printing paper, among others. In the case of cardboard, the best quality fibers are used for cover paper, that is, for outside parts. The ones of lesser quality can be used to produce inner paper.

Acceptance of recycled paper is growing, especially in the corporate market. There is a large ecological appeal, which causes its price to be many times higher than that of virgin material, although that reality is rapidly changing. In 2001, the price of recycled paper was 40% higher than that of virgin paper. By 2004, that difference had already dropped to something in the vicinity of 3% to 5% due to scale production and the reduction in average profit margin.

Image bank: Shutterstock



According to ABPO, more than 77% of corrugated cardboard is recycled in Brazil.

Source: CEMPRE

SALVAGE RATE OF RECYCLABLE PAPER	
COUNTRIES	RATE
Germany	74,5%
Japan	73,1%
Great Britain	64,9%
Spain	58,9%
United States	51,9%
Italy	51,3%
Argentina	46,4%
Brazil	45,0%
Malaysia	43,4%
Mexico	39%
China	34,3%

3.4 RECYCLING METALS

Although it is 100% recyclable, in Brazil steel packaging has still not reached the rate of recycling practiced in some European countries. Data released by Abeco show that in 2008 the country recycled less than half its production of steel cans (49%), while Belgium and Germany, for instance, reached rates in excess of 90%.

One of the most successful initiatives in steel can recycling in Brazil, was the implementation of Reciclaço, a non-profit company owned by Companhia Siderurgica Nacional (CSN), located in the state of Ceara, having as one of its main commitments to take on the parcel of environmental and social responsibility pertaining to steel packaging by the beverage industry, promoting an increase in the recycling rates in the state of Ceara.

Since 2001, when it began its operations, Reciclaço has already recovered more than 930 million steel packages for beverages, which is equivalent to approximately 29 thousand tons of metal. The company has been expanding its accredited outlet network throughout the country and, today, there are more than 300 establishments involving some 45 thousand paper collectors and recyclers in 106 cities in 14 Brazilian states Through the Disque-Aço [Call-Steel] service (0800-172044), answers call from the whole country in search of marketing channels for that type of scrap material.

3.4.1.1 RECYCLING ALUMINUM

Aluminum's quality has rendered it one of the most recycled metals in the world, generating economical, social and political benefits. In Brazil, the reuse of aluminum cans has already become routine, placing the country at the top of the list of recyclers. Today, according to the Brazilian Association of High Recyclability Cans [Associação Brasileira dos Fabricantes de Latas de Alta Reciclabilidade (Abralatas)], more than 95% of these packagings returned to the production process through a network of selective collection which employs more than 180 thousand people.



Image bank: Shutterstock

More than 95% aluminum cans were recycled in Brazil in 2007: an R\$ 1.8 billion business (Source: ABRALATAS).

Data on the recycling rate also shows that in 2007 that market moved approximately R\$ 1.8 billion, of which R\$ 523 million only in the collection phase. According to the Association, this is a consolidated and operating market according to supply and demand laws, with no government interference.

Energy saving is one of the main benefits generated by aluminum recycling. A single can returned can save the equivalent power required to keep a TV set turned on for 3 hours or a 100-watt lamp for 20 hours. The more than 12 billion recycled cans annually equal the quantity of energy required to fill the annual needs of a city with a population of one million plus inhabitants, such as Campinas (SP).

3.5 GLASS RECYCLING

Recycling has always played an important part in the glass industry and gained strength in recent years driven by the present sustainability demand and backed by the industry's initiatives to promote and encourage the use of discarded glass for raw material. Several logistic, environmental, and citizenship programs, besides partnerships with government agencies, private businesses, and third sector organizations caused the recycling rate to jump from 15% in 1991 to 47% in 2007, according to Abividro, the entity representing the industry.

Also in the glass packaging segment recycling is the best alternative for the reduction of the environmental impact of the production chain, It is a fully reusable material and can be recycled indefinitely, generating several benefits. The savings in natural resources, such as sand, soda ash, and limestone, for example, is considerable. One ton of recycled glass accounts for savings of 1.2 ton of raw material. Besides this, it reduces power utilization, gas emissions, and waste and contributes to the increase in the useful life of sanitary landfills, among other benefits.

3.6 RECYCLING WOOD

Recycling is also the best alternative for wooden packaging in the after-purchase. However, this material is culturally little valued in Brazil and the reverse logistic infrastructure for its return to the production lines is practically nonexistent, a reality that, according to Abinci, the Brazilian Association of the Mechanically Processed Wood Industry [Associação Brasileira das Indústrias de Madeira Processada Mecanicamente] tends to change. A greater part of the wood packaging producing companies, especially in the Southern and Southeastern regions, began to implant sustainable production processes and systems, destining its residues to other applications or working on recycling and recuperation of packaging.

Severe laws in some European countries have been forcing the wood packaging industry to introduce the necessary reverse logistics so that their products may be reintroduced in the production process. With the approval of a bill for a national solid waste management policy currently under scrutiny in the Brazilian Congress, the industry should be pressured to search for solutions for wood packaging which today is disposed of in sanitary landfills or incinerated.

In Portugal, wooden packaging manufacturers believe that recycling has great growth potential. Today, the reuse of wooden packaging reaches 14% of utilization and according to industry's goals that rate should reach 15% by 2011. Selective waste collection networks in Portugal collect and sort wastes according to technical specifications set out by the wood recycling industry, determining the minimum quality accepted for industrial processing of the material collected. Most of the recycled wood is transformed into agglomerated wood panels used in the furniture industry, but also for other applications such as beds for animals, surfaces for sidewalks, playgrounds, composite materials or for power generation.

INOVATING WITH PACKAGING

“Eco-business is part of my DNA. I think of Sustainability 24 hours a day. This is my core business”, says Humberto Cabral, founder and President of Embafort Embalagem Industrial. The company with headquarters in Curitiba (PR) recycles wood packaging residues in the production of new packaging for industrialized products. Over 20 years, his team has worked on the development and production of automotive packaging, boxes for export, pallets, and special wooden items. The company dismounts the discarded packaging and using an automated system qualifies each one of the parts which will be used in some 3 thousand projects, in a process which allows for the conservation of approximately 300 trees per day.

ENVIRONMENTAL SOLUTION WITH FINANCIAL GAINS

Madeiraira 3 Filhos is a small company with headquarters in Jaguariaíva (PR) that operates in the breakdown of wood segment for use in pallets and settee bases. During 2005, the company began processing residues (generated during the processing of logs such as lumber slabs, wood trimmings and shavings) using equipment that Transforms it in fuel for energy generation in greenhouses for drying wood and other products. The objective was to add value to these residues, using reverse logistics of post-consumption practices, and to obtain financial gains. The investment was of approximately US\$ 19 thousand, and today brings about an income of at least US\$ 1,250 monthly. Besides this, the initiative contributed towards the forming of a good corporate image for the company, due to the environmentally correct actions it practices.

3.7 RECYCLING CARTONED PACKAGING

The recycling of cartoned packaging is also in an early stage in Brazil, but the rate has been increasing rapidly over recent years. In 2008 alone it grew more

than 7% and has more than doubled since 2002. The goal set by Tetra Pak is to reach 40% in 2010. However, in order to get there, the company must face such difficulties as the forming of a selective collection and recycling network, and a cheaper way of separating the three types of raw material employed, thus allowing them to return to the production line once more.

The development of this process took seven years and involved several kinds of research, with investments amounting to R\$ 60 million in a partnership with Tetra Pak, Alcoa, an aluminum producer, Klabin paper manufacturer and TSL Ambiental, a company specializing in environmental services. After several attempts, they arrived at plasma technology, unheard of worldwide, which revolutionized the present recycling model when separating the three components of the box. With help from the Technology Research Institute for the State of São Paulo [Instituto de Pesquisas Tecnológicas do Estado de São Paulo], and started operations in 2005, after three years of testing.

The recycling of the cartoned packaging began with the separation of the paper fibers, using a piece of equipment called hydropulper, similar to a giant blender, which is responsible for extracting the vegetable fibers. After the fibers have been washed and purified they may be used in the production of paper for cardboard boxes, tubes or even paper for printing.

The remaining material, composed of plastic and aluminum, has been allotted to plastic processing plants, where it is recycled by means of drying, shredding, extruding and injection processes. It is used for the production of plastic parts such as spade handles, brooms, dustpans and others. The plastic/aluminum parts have several applications in civil construction, in the form of sheets similar to plywood, or in the manufacture of dividing walls, furniture, small decorative items and roof tiles.

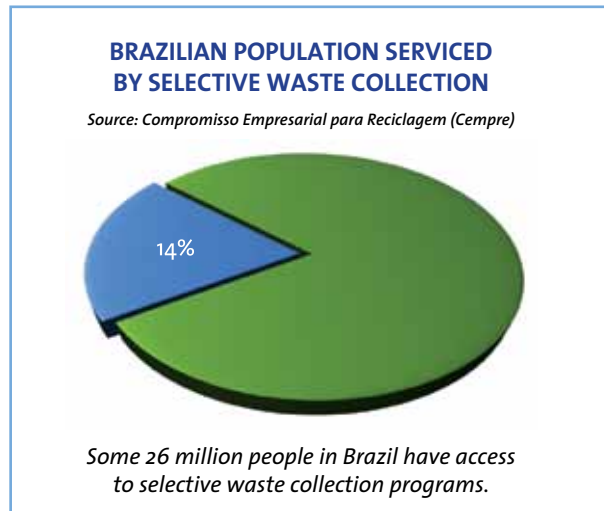
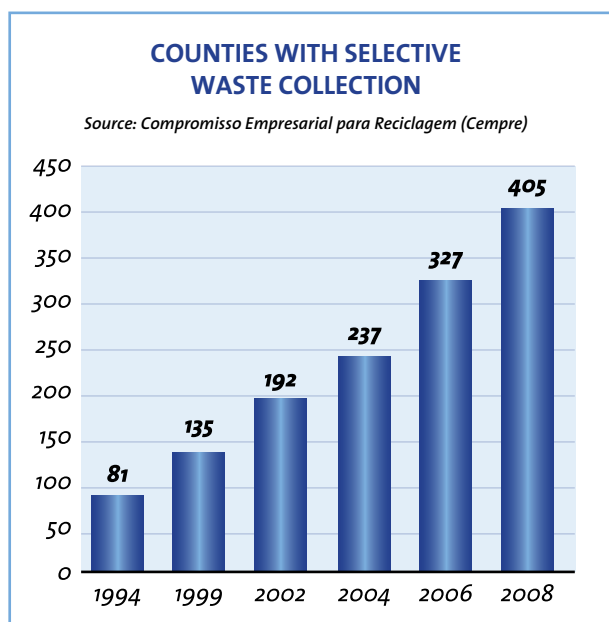
As of the introduction of the plasma oven, the plastic/aluminum composite is heated to extremely high temperatures in an oxygen-free atmosphere (in order to conserve the quality of the aluminum). The

process breaks down the plastic molecules, transforming it into paraffin, used in the petrochemical industry, and the aluminum is smelted and again becomes a pure raw material, that can be reused in the long-life packaging itself. This technology is currently adopted in one single plant in Brazil that has been operating on an industrial scale since June 2005, in Piracicaba (SP).

With a recycling rate of only 26.6% in 2008, the segment was able to generate, at the end of the chain, sales of R\$ 100 million, demonstrating its market potential. That is to say, each ton of recycled plastic and aluminum draws some R\$ 2 thousand from trash, bringing benefits, especially, to a group of people who live below the poverty line, besides the environmental profits that reach the whole of society.

3.8 SELECTIVE COLLECTION, THE GREAT CHALLENGE

The large bottleneck for the recycling industry in Brazil is the absence of an efficient selective collection system. To illustrate this, there are more than 5,500 counties in the country and only 405 of them have any kind of collection system for recyclable material post-consumption, which covers only some 26 million Brazilians.



Recycled plastic material may be a regulator for the fluctuations in the supplier market, and may even cause a reduction in raw material costs. The recycled plastic has applications not only in traditional markets of virgin resins, as well as in new markets. It may be used for the production of bottles, flasks, buckets, hangers, combs and other artifacts produced using an injection process, as well as so called “plastic wood”, bristles, brooms, brushes and other products which are manufactured using fibers, as carrier bags and other types of films besides the panels used in civil construction. New technologies begin to produce recycled plastic resin as well as packaging for foodstuffs.

3.9 A DEMAND HIGHER THAN SUPPLY

The recycling of PETE bottles in Brazil is an example of the advantages of recycling plastic. That activity is growing at such a speed in recent years that companies depending on this raw material are beginning to encounter difficulties in filling their needs, according to Abipet. Currently, a series of items such as clothes, paints, brooms, automotive accessories, among others, are manufactured from this recycled raw material, in a chain that involves micro, small, medium and large businesses, joining financial gains to the concerns about sustainability. PETE recycling chain is divided in three stages: collection and pressing, decontamination and flake production, the transformation of flakes in resins. These stages demand

different levels of investments, allowing the activity to be carried out both by micro-businesses and by large corporations as can be seen in the table below.

3.10 INCINERATION

Energy recovery is an alternative accepted by a large portion of specialists for the destination of some solid waste. According to the president of Plastivida, Francisco de Assis Esmeraldo, who is also a member of the Council for the Environment at FIESP [Conselho Superior de Meio Ambiente] “a large quantity of solid urban residues is wasted in garbage dumps and sanitary landfills that are near their saturation point”. He explains that there is already safe local technology available for treating such residues at energy recovery facilities transforming them in electric and thermal energy, without harming the environment.

He points out that this process is a reality worldwide as a form of replacing fossil fuels with alternative sources of Energy. This currently is responsible for the final destination of some 130 million tons/year of urban waste, to the 750 plants installed in 35 countries In Europe, USA, Japan and Asia. Among the advantages of the energy recovery is the non-generation of liquid effluents as is the case of compost making and, therefore, the non-contamination of hydric resources.

Besides this, according to the president of Plastivida, incineration does not emit methane gas, toxic gases, odors or noises. When incinerated, one ton of Long Life packaging is equivalent to the energy of five cubic meters of lumber or approximately 40 adult trees or even to 500kg of fuel oil.

FROM THE GARBAGE TO CLEANING

All brooms, brushes and squeegees manufactured by Polares Industrial, located in Piracicaba (SP), are manufactured from long life packaging. Célio Sanches, owner of the company, explains that, when using long life residues, they save 20% in the purchase of material. The company has been in the market since 1987 and has always used material from selective collection or scrap from various industries. Ten years ago, it began to work with pellets, a kind of aluminum and plastic grain produced from the packages. Bristles for brooms come from scraps of PETE bottles. Today it produces 250 thousand items per month, of which 40% use the material stemming from cartoned packaging, a percentage that is not higher solely from lack of supply of pellets, due to the small number of companies supplying the market. Polares alone purchases 12 to 15 tons per month.

THE RECYCLING CHAIN		
FIRST STAGE		
Activity	Investments (Initial)	Type of company
<i>Collection and crushing PETE packages</i>	<i>R\$ 30 thousand (press and scales) and the location</i>	<i>Micro entrepreneurs, associations and coops</i>
SECOND STAGE		
Activity	Investments (Initial)	Type of company
<i>Decontamination of bottles and transforming material into flakes</i>	<i>R\$ 300 thousand to R\$ 500 thousand</i>	<i>Small companies</i>
THIRD STAGE		
Activity	Investments (Initial)	Type of company
<i>Transforming flakes into resin</i>	<i>R\$ 5 million</i>	<i>Large corporations</i>

4. Other solutions and cases

4.1 THE GREEN PLASTIC

The successful experience of using biomass energy created a favorable environment, in Brazil, for the development of new applications using ethanol. Several Brazilian researchers have also attempted to produce a type of plastic using renewable sources. These experiments resulted in Braskem announcing, in April 2008, the laying of a foundation stone of a new plant for large scale production of bio-polyethylene.

According to information provided by the company, the bio-polyethylene results from a polymerization process equivalent to processes which are already known and dominated and having, as a differential, the use of sugar cane as their primary source. The product is already known as “green plastic”, due to its reduced environmental impact features, both during the production phase and in the after-use. Each kilo of “green polyethylene” produced captures and fixes 2.5 kg of CO₂ from the atmosphere.

The product has physical features equivalent to those of the petroleum derived polyethylene, with the advantage of allowing certain applications. With the “green ethane” it is possible to produce several types of polyethylene such as HDPE (high density polyethylene), LDPE (low density polyethylene), UHMWPE (ultra high molecular weight polyethylene) and LLDPE (linear low density polyethylene).

4.2 BIOPOLYMERS ARE NOT PANACEAS

Eloisa Elena Garcia, a researcher with the Instituto de Tecnologia de Alimentos (ITAL) warns for the risk of companies using the so called “biodegradables” as a marketing strategy and fomenting the illusion that degradation is the solution for the problem of treating solid wastes. According to her, “the consumer is led to think that he/she can discharge waste anywhere, thus compromising important concepts such as that of sorting waste for recycling or for sustainable consumption ends.

According to her, biopolymers also need to demonstrate that the impact on the environment associated to their life cycle (production/transformation/use/final disposal) is favorable. “The responsibility of the producer, transformer, user and consumer are the same as those of non-renewable source plastic”, she says. That is to say, they need to be revalued in the post consumption stage through mechanical, energy or composting recycling.

The problem of the biodegradability, the researcher mentions, is that some 50% of the solid urban waste in Brazil are organic and a great majority are not taken advantage of for compost making, remaining in open air garbage dumps. Therefore, what seems to be a solution for plastic material management may become an aggravating circumstance for the problem of solid waste, for which to this day no solution has been found.

5. Conclusions

Given the diversity of raw materials and the technical requirements of packaging materials, there are also several alternatives for reducing the impacts of post consumption. The ideal solution is to reduce their use in such a manner as to progressively diminish the use of discarding solutions which are not environment friendly. Another is to reuse, when packaging may be returnable, which is possible in several segments. When they can be replenished by refills and have their useful life extended by consumers. Or simply when they can be recycled and return to their raw material condition. There are named the “three ‘r’s”.

Packaging may be an important part of the solution for environmental and social problems, providing they are thought out from their conception and take into account their use and final destination. An alliance begins to form among all those involved in the value chains, producers, carriers, businesses and consumers, to work towards transforming post consumer waste into high added value materials, organizing and managing the forms in which waste is disposed of.

Consumers, to whom products are intended, become partners in industry and commerce in order to achieve positive results from this value chain. And consumers are the ones who will increasingly press for sustainability in the final presentation of products and the form in which they are made available to them.

Packaging may cross the line which places them as part of the problem, to become an important player in the solution of matters involving the environment and sustainability.

6. Walmart initiatives

6.1 SUSTAINABILITY VIEWPOINT

From 2005, Walmart has based its initiatives on global environmental goals, organized in three main pillars: Climate and Energy, Waste and Products. The Climate and Energy pillar focuses on actions to reduce energy consumption and to use more efficient technology and practices having a lesser impact on logistic systems and on buildings. The Residue pillar is focused on a betterment of the management, with the reduction in raw material consumption, re-utilization and recycling of materials and the correct final destination of discarded material. In Products, the company has been working with its employees to consider the environmental and social features of products, evaluating the process involving production and transportation of merchandise.

6.2 ZERO IMPACT

The retail networks have as one of their main environmental impacts the generation of solid waste. One of the company’s global goals states its reduction in 25%. Last year, Walmart Brazil began a management organization process for this waste, creating an area to deal with this specifically. The Zero Impact program was developed initiating with the mapping of the features of each residue (recyclable, organic, lamps and batteries, among others), with identifying the main hindrances related to their treatment and final destination. The program proposes the improvement of the processes of purchasing, warehousing, transporting and exhibiting the products on the shelves as a form of immediately reducing the emission of waste and initiatives to maintain the materials within the productive cycle. Walmart promotes also the betterment of its management process in the organization of transportation and warehousing and in the fight against the squandering of food (Food Bank). Besides this, it establishes procedures for the correct separation, packing and warehousing of the material to be discarded.

LOW IMPACT PACKAGING - HIGHLIGHTS

PRODUCT	WHAT CHANGED IN THE PACKAGING	IMPACT
<i>Equate Cotton Swabs</i>	<i>Packaging certification with FSC seal</i>	<i>Contributes to curb deforestation and the indiscriminate use of wood</i>
<i>Ol’Roy beef cutlets</i>	<i>Reduction – 4 grams to 2.5 grams</i>	<i>Annual savings of 8.4 tons of plastic</i>
<i>Baker’s & Chefs, Top Chef and Great Value French fries and chipsticks, and Great Value this spaghetti and snacks.</i>	<i>Use of ink without chemical solvents for printing</i>	<i>Reduction of gas emissions which cause greenhouse effect</i>
<i>Top Max steel sponge and Top Chef frozen French fries</i>	<i>Material reduced by 25% and 20% respectively</i>	<i>Reduces the use of material from non-renewable source</i>
<i>Sustax Kids</i>	<i>16% reduction in can size, from 13.5 cm x 18.5 cm to 11.2 cm x 16 cm</i>	<i>Annual savings of 1 ton of steel</i>

6.3 JOINT ACTIONS

Walmart owns 27 exclusive brands, among global, national and regional brands, which comprise 12,000 items, among food products and non-food products. The company has been urging suppliers to develop ever more sustainable packaging for their products, by reducing the amount of material employed, use of recyclable raw materials or having the FSC seal applied to them, which warrants that the material used comes from forests with sustainable management. During 2008, 80% of the private label launches using paper or wood for packaging already complied with these requirements. The goal is to reach 100% in 2009.

Walmart encourages the development of products having a lesser impact on environment, offering them a special place in their stores. Many companies opt to add value to brands which are already consolidated and count on help from the network to introduce the novelties to the market. This is the case of the Sustainable version of Monopoly (Banco Imobiliário Sustentável) which was marketed exclusively by Walmart stores in 2008. The new version of the most traditional of Estrela’s board game which sales achieved a second place in the product line in only six months. The company has been producing a classic



Walmart Brasil

Sustainable Monopoly: a sales hit



Procter & Gamble's Ariel Ecomax, reduces by 30% the water necessary for rinsing.

version of Monopoly (Banco Imobiliário) since 1944 and the idea of creating a more sustainable version arose from a partnership with an innovative product developed by Petroquimia Braskem, the polyethylene manufactured from sugar cane which, besides using a renewable source, captures CO₂ from the atmosphere, together with Estrela. Besides using the “green” plastic, the other pieces are made of FSC certified paper and cardboard and the whole concept of the original game was remodeled: the player does not purchase property, but carbon credits.



Etruria recycles some 800 tons of PET per month for manufacturing blankets.

Walmart has the exclusive sales rights for Procter & Gamble's Ariel Ecomax, which produces less foam, reducing the water required for rinsing by 30%. The product's packaging was reduced by 2 cm (20%), saving paper and storage and transport space. Another example is Kimberley-Clark's Neve brand toilet paper, which has a Naturali version, also marketed exclusively at Walmart stores. The new version uses only recycled fiber from selected paper scraps, without prejudice to quality, and is marketed in 50 meter length rolls (normally they measure 30 m), which corresponds to more product per packaging.

The blanket manufactured using recycled fibers from PET bottles is a reference among low environmental impact products from Walmart's exclusive brands. Each item uses, on average, 200 two liter bottles. 800 tons of PET are recycled monthly by Etruria, a supplier of the product located in the town of Mairinque (Sao Paulo state). In the stores, the blanket is promoted as a product with a sustainable differential and the packaging informs the number of bottles used in the manufacture of each item. The product contributes towards making customers aware of the sustainable practices and, at the same time, collaborating to reach the Walmart goal of selling for less. The repercussion was so good that it won them a prize, the “Planeta Sustentável” [Sustainable Planet], promoted by Casa Claudia magazine, edited by Editora Abril. Plans are in place to export the blanket to the United States.

The partnership between Walmart and its suppliers helps to more efficiently manage the waste. In a sole initiative introduced during 2008 with the Nestlé Brazil Foundation, for example, two Bompreço stores, one in Salvador and one in Recife, received kiosks where Nestlé products packaging was received for disposal. With every seven items of packaging delivered the customer would receive the recipe booklet “Programa Nestlé Faz Bem Nutrir”. Diageo, a liquor manufacturer, was a partner in a pilot project to stimulate the recycling of glass and installed collectors of this material in the Walmart stores located in Tamboré and Morumbi, in São Paulo and in Campinas, Rio de Janeiro. In partnership with the Whirlpool electrical appliances owner of the Brastemp and

Consul brands a pilot project was implanted to collect discarded packaging for these products at the customers' homes. During 2008, tests were carried out in Curitiba and Porto Alegre and the material collected was donated to Associação de Reciclagem Ecológica Rubem Berta, Cooperativa de Catadores Zumbi dos Palmares e Associação Santo Anibal.

6.4 AWARENESS AND INVOLVEMENT

The use of plastic carrier bags is a huge challenge for the company in its fight for reducing waste. In the country, the network consumed some 1.4 billion units of the product in 2008, which is equivalent to 5.32 thousand tons of plastic resin. In search of efficient solutions in order to achieve the bold goal of reducing the use of plastic carrier bags by 50% by 2013, Walmart Brazil is carrying out research and projects with the objective of offering sustainable alternatives for the use of these plastic bags.

During 2008, a pilot project in three stores in Curitiba – Mercadrama Mundo Novo, BIG Pinheirinho and Maxxi Jardim das Américas – customers were presented with alternatives for the plastic carrier bags. Among the several choices presented, such as boxes, paper carrier bags, among others, the cotton carrier bag was the most acceptable to the customer and, for this reason, chosen to be offered in stores throughout the network. Cream in color and with the words “I make a difference. I use a reusable carrier bag” (“Eu faço a diferença. Uso Sacola Retornável”), printed on them, arrived at all the Walmart stores in Brazil, besides being distributed to their 75 thousand employees. During the first year of the program over 1.5 million units were sold.

A CONSCIOUS CUSTOMER MERITS CREDIT

In December 2008, a program was introduced in the Bompreço and Hiper Bompreço stores in the cities of Recife and Salvador which offered financial discounts to those customers who did not use plastic carrier bags. The rebate was calculated automatically at the store check-out points. A rebate of R\$ 0.03 would be given for each plastic carrier bag not used (an amount corresponding to the unit cost of each carrier bag) for each five items purchased. Or: When purchasing 200 items the customer would earn a R\$ 1.20 rebate. And if the customer took home less than five items without using the plastic carrier bags, he/she would also earn a rebate. The program received from the city council of Recife a “Vote of Applause for the social-environmental responsibility actions due to the rebates offered to customers who refused the use of plastic carrier bags at Bompreço stores”. With the expansion to the southern region of Brazil, by the beginning of June 2009 some 2 million plastic carrier bags had stopped being distributed. By the end of 2009, expectations are to expand the initiative to all Walmart stores in Brazil.



Cotton Carrier bags: well accepted by consumers

A project implemented by the Instituto Walmart in partnership with the Instituto Coca-Cola from 2007 promoted the installation of Recycling Stations in 290 units of the Walmart network. The containers destined for the selective collection of plastic, pa-

per, metal, glass and cooking oil helped to inform store customers and stimulate recycling of materials. Wastes are removed and reused by the garbage collection coops that convert them into exchange value products and make this an important source of income. Throughout the year the project counted on the work of 42 garbage collector coops. The project also includes Cempre (Compromisso Empresarial para a Reciclagem), a non-profit institution which offers technical support to the coops involved in the project. Walmart and Coca-Cola have been associated with Cempre from its founding, in 1992. The program's goal up to the end of 2009 is to set up these points of voluntary delivery of recyclable materials in all the network's stores, and with this expect to contribute towards income generation at 80 coops and to some 2,500 coop members.

Walmart Brasil



TO TAKE HOME

Walmart invests in training for all of its employees on the concept of sustainability. Besides this, it developed the Personal Project for Sustainability (PPS) through which the employee is encouraged to set personal goals in order to contribute towards the sustainability of the planet. During 2008, over 40 thousand employees adopted personal goals, which represents 50% of the employees. One or more PPSs, in seven categories will be adopted: responsible shopping, waste reduction and recycling, health and wellness, energy, water, mobilization and voluntary work.





In a joint action between Walmart and Coca-Cola and Cempre (“Compromisso Empresarial para a Reciclagem”), by the end of 2009 the Recycling Stations [Estações de Reciclagem] program’s goal is to set up recyclable materials receiving points in all the network’s stores, and with this they expect to contribute towards income generation for 80 coops and to some 2,500 coop members.

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MASTHEAD

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