

Packaging and its impact on environment : Challenges and opportunities

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SUMMARY : The term ‘Packaging’ is no more restricted to its basic functions like containment, protection, and preservation. Packaging plays an important and intermediate role in marketing. Packaging design must attract consumers in today’s increasingly competitive and quickly changing market. Focusing on advanced technologies, the packaging industry is bringing in more innovations to meet the demands of the customers. However, these innovations have also created a problem of accumulation of packaging solid waste in huge quantity, leading to environmental hazards. In the current days, rise in concern over environmental hazards, eco-friendly packaging, and waste reduction targets specified by other countries has been observed. Preventing packaging waste and minimising its environmental impact is a complex task. Waste prevention should not be considered solely as qualitative and quantitative reduction of packaging materials, rather it must take account of the entire process chain – from production, distribution and sales to use by the consumer and subsequent disposal. Most packaging and containers are made from materials such as plastic, cardboard, glass and steel, which can be recycled easily and effectively. Recycling packaging diverts large amounts of waste from landfill and has many other environmental benefits. For instance, it takes about 84 per cent less energy to recycle a plastic bottle than to make one from raw materials. However, the market for recycled plastic products is limited due to inconsistency of the raw material. The rise in environmental consciousness in recent decades has included a focus on household waste. It is not the most urgent of the problems we face, but it may be the most immediately accessible. Garbage disposal happens again and again, right at home under our personal control. The problem of solid waste has expanded rapidly in recent times; most adults today remember growing up in a world that used much less packaging. There is an urgent need to look into some major aspects of packaging that are believed to have a negative impact on the environment. The participation of local municipalities and consumers as well as people in industry is extremely vital in addressing the problems impacting the environment.

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Packaging may be defined as “the container for a product – encompassing the physical appearance of the container and including the design, color, shapes, labeling and materials used” (Deliya, 2012).

Generally the packaging is classified into three types: primary, secondary and tertiary packaging. Primary packaging contains the actual product and can also form the consumer packaging, which is used for display at the point of sale (POS). The secondary packaging is of a greater dimension and carries a number of single packaging. The tertiary packaging is used for

storage and distribution.

Functions of packaging :

Unlike other industries, the packaging industry plays a unique role-on one hand, it creates wealth through a wide range of manufacturing activities while on the other; it preserves the wealth and value created by the other industries. Hence packaging plays an important role in preserving created values.

Preservation of the quality and lengthening of the shelf-life for innumerable products – ranging from milk and biscuits, to drugs and medicines,

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processed and semi-processed food, fruits and vegetable, edible oil, domestic appliances, industrial machinery, hardware and electronic goods etc. It is the biggest value addition done by the industry for all packaged goods.

As mentioned by Saha (2014), "In the modern market where self service is practiced, consumer goods in packaged form are picked up by the consumer mainly due to its attractive packaging. In other words, packaging not only attracts but also drives the buying decision of the modern consumer." A well-designed package inspires confidence towards product safety. In addition, packaging.

- Provides a physical barrier between a product and the external environment thereby ensuring hygiene and reducing the risk of product wastage due to contamination.
- Prolongs the life of food.
- Is needed for safe and efficient transportation.
- Provides customers with information and instructions, for which there are some legal requirements.

Beyond convenience and protection, packaging acts as a medium of communication between the manufacturer and the consumer (particularly for FMCGs). It provides information regarding the product contents (e.g. from listed ingredients and/or an image of what is contained within). This information may be promotional, factual or mandated by regulation. It serves as a cue in assisting the consumer when faced with multiple products from which he/she makes a decision to buy or not-to-buy. This is imperative in view of the changing lifestyles and time pressure on consumers, combined with widening product variety.

Packaging and marketing :

Role of modern packaging has gone beyond just preservation and transportation. With technology and innovations, it is used for enhancing brand image as well. Increasing number of companies (about 50%) are on the lookout for innovative ideas in packaging which are in tune with their brand image (Srikant, 2013).

Packaging is recognized as an integral part of modern marketing operations which embraces all phases of activities involved in the transfer of goods and services from manufacturers to customers. Packaging stands for a spectrum of materials, production technologies, printing techniques and advanced manufacturing. It needs to satisfy diverse clients and consumers.

As the only part of the marketing communication that the consumer takes home, packaging plays a key role in communicating and reinforcing brand values over time. In this regard, packaging could act as a "brand ambassador" for products during extended usage. If the customer decides to buy the product, the packaging must facilitate usage by

providing the right information and user-friendly functions. In short, the packaging has to provide the customer with the right clues and cues – both at point of purchase and during usage.

Packaging at point of sale :

Packaging's dual role, as a marketing tool along with communication, continues its impact on the consumer (reminding the consumer of the merchandise and the identity of the product). The importance of making an impact at the point of sale is particularly significant in context of grocery shopping, where the consumer might visit a supermarket containing 25,000 items but might only seek to fill a shopping basket with around 40 items. This calls for consumers to sift through a vast array of products to choose what they want – and not surprisingly they end up ignoring most of what they pass. If the customer decides to buy the product, the packaging must facilitate usage by providing the right information and user-friendly functions. Packaging must provide customers with the right cues – both at point of purchase and during usage.

At the point of purchase, packaging serves a number of key functions, namely:

- Standing out in the crowd,
- Communicating information about the product enclosed,
- Stimulating or creating brand impressions,
- Providing various brand cues.

Extrinsic cues (such as price, brand name and the package, which are not part of the physical product) work together to influence the purchase decision. The salience of intrinsic attributes at the point of purchase depends on whether they can be sensed and evaluated at that time. In particular, extrinsic cues may serve as quality indicators when the consumer is operating without adequate information about intrinsic quality attributes.

The packaging elements can have a strong or weak influence on consumers purchase decisions depending on the consumer's involvement level, time pressure or individual characteristics. In general, consumer attention tends to be driven by in-store factors and extrinsic cues, as consumers have neither the desire nor the need to comprehensively investigate and assess all the offerings available to them.

In a setting like a supermarket, the wide choice of products and the varied range available to consumers at the point of sale compel producers to work harder to achieve effective differentiation and appear distinct for which effective use of mass media promotions of sale is demanded.

In a standard supermarket, a typical shopper might pass around 300 products per minute. This translates into less than one-tenth of a second spent for viewing a single product to gain the attention of the customer and spark a purchase.

Therefore, packaging design to grab attention is critically important. The package must perform many of the sales tasks for making an overall favourable and immediate impression. For instance, Pepsi has based its packaging strategy around the color blue, even though red is generally associated with soft drinks (and indeed is the colour used by its great rival Coca-Cola). Thus, whether or not there is a general colour association, a product could choose both to gain attention and differentiate itself by using a distinctive visual (non-verbal) packaging strategy.

Memorable and distinctive packaging is something that all leading brand producers strive to achieve and maintain. *Staying ahead of the pack of "me-too" copies and imitations is the ultimate design challenge.* It is a remarkable feature of the FMCG sector that it supports such a wide range of products with distinctive packaging that allows a product to stand out as truly distinct even among as many as 25,000 items.

Indian packaging industry :

The annual turnover of Indian packaging industry will touch \$ 32 billion by 2025 from the present \$ 24.6 billion. In the world scenario, the total turnover of packaging industry is about \$ 550 billion where Indian share is about \$ 24.6 billion per annum. The annual growth rate of this sector is about 15 per cent per annum (Natchiappan, 2014).

As per the McKinsey report (2007), there will be ten times increase of middle class population by 2025 in India which will further trigger the consumption of packaging material and thus, the packaging industry will grow further. As Indian incomes rise, the shape of the country's income pyramid will also change dramatically. Over 291 million people will move from desperate poverty to a more sustainable life, and India's middle class will swell by more than ten times from its current size of 50 million to 583 million people.

The packaging industry is facing challenges in dealing with the solid waste generated by the packaging of a product. In India the major challenge is to tackle the packaging solid waste management in a proper manner. The consumption of packaging is growing which is leading to the accumulation of solid waste (Saha, 2014).

He suggested that the government must involve stakeholders, including NGOs, along with municipality to deal with the situation. It would be appropriate to formulate a policy by way of involving all the stakeholders and also fix responsibilities to tackle this challenge.

According to a report on packaging industry in India by The Indo-Italian Chamber of Commerce and Industry, food packaging, cosmetic packaging, pharmaceutical and liquid packaging, are the main demand generators for packaging industry. To meet this rising demand from the region, there are nearly 400 to 500 units operating in the twin cities of Noida and Greater Noida. However, in the entire NCR, there are close

to 1,500 packaging players in the industry. Most of them are unorganized and need proper guidance.

Packaging materials :

Knowledge of the functions of packaging and the environment where it has to perform will lead to the optimization of package design and the development of real, cost-effective packaging.

The most common types of materials used for packaging are paper, fibreboard, plastic, glass, steel and aluminum.

Paper :

One of the most widely used packaging materials, particularly corrugated cardboard used for transport packaging. The current recycling rate for paper and board packaging waste is 49 per cent.

- To produce each week's Sunday newspapers, 500,000 trees must be cut down.
- If all our newspapers were recycled, we could save about 250,000,000 trees each year.
- The average household throws away 13,000 separate pieces of paper each year; most of it is packaging and junk mail.
- Each tone of recycled paper can save 17 trees, 380 gallons of oil, three cubic yards of landfill space, 4000 kilowatts of energy and 7000 gallons of water. This represents a 64 per cent energy savings, a 58 per cent water savings and 60 pounds less of air pollution.

Glass :

It is the most common form of packaging waste. Glass can be returned and reused or recycled easily.

- Every month we throw out enough glass bottles and jars to fill up a giant skyscraper. All of these jars are recyclable.
- A modern glass bottle would take 4000 years or more to decompose and even longer if it is in the landfill.
- Recycled glass uses 40 per cent less energy than recycled aluminium and 50 per cent less energy than HDPE.

Like any material, glass has some disadvantages. Despite efforts to use thinner glass, its heavy weight adds to transportation costs. Another concern is its brittleness and susceptibility to breakage from internal pressure, impact, or thermal shock.

Aluminium :

It is used in many packaging applications such as beverage cans, foils and laminates. It has a high value as a scrap metal and can be recycled economically.

- We use over 80,000,000,000 aluminium soda cans every year.

- An ‘aluminium can’ that is thrown away will still remain a ‘can’ 500 years from now.
- There is no limit to the number of times an ‘aluminium can’ be recycled.

Steel :

The expansion of steel use in packaging is not feasible. Its usage is restricted to a narrow horizon of goods, such as perishable food (fish, meat, vegetables, fruits), paint and beverage. Considering their light-weighting, and the expansion of other packaging materials usage, the percentage rate of steel use will probably decrease.

- Steel is 100 per cent recyclable. Being a mono-material, it is easy to recycle.
- Because steel is magnetic, it is easy to remove from waste streams.
- Recycling one tonne of steel cans saves 1.5 tonne of iron ore, 0.5 tonne of coking coal, 1.3tonne of mining waste and 1800 kg of carbon dioxide emissions.

Plastic :

It offers several advantages over other packaging materials in its sturdiness and low weight.

- Plastic bags and other plastic garbage thrown into the ocean kill as many as 1,000,000 sea creatures every year.
- Recycling plastic saves twice as much energy as burning it in an incinerator.
- Americans use 2,500,000 plastic bottles every hour. Most of them are thrown away.

Composite materials :

Packaging can sometimes have the benefits of being more resource and energy efficient than single material packaging, but combining materials makes recycling difficult. Recycling these materials is hindered by the lack of facilities and technology necessary to separate materials to avoid contamination. Compositematerials packaging can be reprocessed into other products such as floor coverings, shoe soles and car mats, incinerated to produce energy, or land filled.

Bugusu and Marsh (2007); Surpur (2012) and Chunawala and Venkat (2013)

Impact of packaging on environment :

The rise in environmental consciousness in recent decades has included a focus on household waste. It is not the most urgent of the problems we face, but it may be the most immediately accessible. Garbage disposal happens again and again, right at home under our personal control. The problem of solid waste has expanded rapidly in recent times; most adults today remember growing up in a world that used much less packaging.

Perhaps most important of all, packaging feels wasteful: used once and then promptly discarded, it seems like onlytransient presence in our lives as it rushes from factory to landfill. Yet packaging remains everywhere; it is impossible to imagine an urban, industrial society functioning without it. Since the first packages were created well over 10,000 years ago, packaging has served many important purposes: To contain, carry, protect, preserve and to make a product look so enticing that it simply must be bought.

Modern packaging has made life easier in many ways :

- Food preparation and storage
- Longer shelf life for products
- Frozen foods
- Processed foods
- Take-out foods.

Unfortunately, such convenience has come at a price, which is the environment.

Cooking food has a much greater impact in smaller households. It takes almost the same amount of energy to boil one egg as it does to boil four at the same time. Large households are relatively efficient in terms of food. They buy larger sizes, eat more meals together and therefore per person they generate far less waste. A person living alone has roughly double the environmental impact of one who lives in a large household.

At the same time there are compensating developments that will tend towards reduced packaging. For example, many companies, especially in the retail sector, are increasingly designing all the packaging needed to protect goods (the packaging immediately containing the goods, the secondary or grouping) as complete systems. This has made more effective use of resources. Consumers are increasingly willing to buy concentrated products in lightweight refill packs to bedilutedlater at home. Companies are increasingly informing consumers about the choices available to them, enabling them to make informed decisions about the products they buy and how to use them efficiently.

The green packaging market is likely to register consistent growth during 2011-21, mainly influenced by growing concerns over environmental hazards, eco-friendly packaging, carbon emissions, and waste reduction targets specified by different countries. All these factors have given a boost to sustainable and green packaging solutions in India (Mitra and Pandya, 2012).

However, much of the activity now regarded as environmentally responsible has long been standard business practice. Light-weighting, waste reduction, energy conservation, control of emissions and effluents, process and product efficiency improvements and so on, are all well established in business operations. What is changing is their diversity, complexity, significance and majorly the importance

now attached to environmental performance in the overall assessment of companies (Levy, 1993).

According to an INCPEN case study, "Packaging and Sustainable Development", today there is need to -

- Design good packaging systems that get products from manufacturer to consumer with the minimum necessary expenditure of resources.
- Invest in modern solid waste management techniques so that we can reduce the environmental impact of ALL waste, not just packaging.

When designing a product and its packaging, it is important to ensure that there is minimum or no wastage of materials during fabrication of the packaging material. Choice of packaging type is made on the basis of a series of trade-offs between many factors, particularly between the amount of packaging and likely product wastage. Consumers are increasingly willing to buy concentrated products in lightweight refill packs for dilution at home.

Some questions regarding the kind of material and its impact are - Does the package thickness matter? Why are packages layered? What kind of packaging material is recycled? These have been addressed below.

Packaging materials differ in thickness. The thinner the packaging material, the less landfill space it will take up. Thin plastics can be very strong. Some manufacturers have addressed the packaging dilemma by switching to strong, thin materials for wrapping such items as disposable diapers and dinner napkins. However, the use of thinner plastics in food packaging can reduce safety and protection from contaminants, punctures, and tampering.

Sometimes two or three materials are combined or laminated or sandwiched together to keep foods safe and fresh. However, such multi-layered or sandwiched materials are difficult to recycle. For example, soft drink box cartons have six layers including polyethylene, foil, and paper used intermittently. Each layer is necessary to preserve the drink. Another food wrap that currently can't be recycled is foil-backed sandwich wrap that helps keep a sandwich warm.

The most preferred way of reducing the packaging's environmental effects is the light-weighting of packages. It is a free market oriented issue; its regulation is not possible and also not necessary.

Source reduction : Light-weighting the package :

Source reduction reduces the amount of materials we produce and the harmful environmental effects associated with producing and disposing of them. EPA considers source reduction the best way to reduce the impact of packaging waste on the environment because it avoids waste generation altogether. The basic elements of source reduction include the following :

- Reduced material use in package manufacture

- Decreased toxicity
- Package reuse
- Reduced/more efficient use by consumers
- Increased production efficiency resulting in less production waste
- Avoided waste collection, transportation and disposal costs (EPA, 1995 and Pongrácz, 1998).

According to the understanding developed by SmithersPira (Printing Industry Research Association), light-weighting and cost avoidance are the common package challenges. Reducing materials weights and modifying pack format to lighter configurations is an ongoing effort for almost every business in support of cost reduction, reduction of environmental burden and progressing towards sustainability.

Flexible packaging is recognized as the lightweight package format. The industry has achieved significant source reductions in the past decade, and will continue to further innovate in the upcoming decade to optimize materials and systems. Following are a few examples of light-weighting:

- The use of co-extrusion technology allows some cheese packages to reduce the overall thickness of the package by 33 per cent, while still maintaining the oxygen and moisture barrier.
- Advancement in the area of barrier enhancement through 'cross-linking' results in better properties such as material toughness or water and oxygen barrier, while using less material.
- Process optimizations, utilizing new equipment technology, the latest resins, and manufacturing process innovations, enabled shrink film to be reduced by 50% (FPA, 2011).

Recycling of packaging materials :

Recycling diverts materials from the waste stream to material recovery. Unlike reuse, which involves using a returned product in its original form, recycling involves reprocessing material into new products. A typical recycling program entails collection, sorting and processing, manufacturing, and sale of recycled materials and products.

Almost all packaging materials (glass, metal, thermoplastic, paper and paperboards) are recyclable. Various factors play into any economic assessment of recycling, including costs for collection, separation, cleaning or reprocessing, and transportation (energy). There also needs to be a market and application for recycled products and the existence of competing materials.

For instance, materials reclaimed through metal and glass recycling are considered safe for food contact containers because the heat used to melt and form the material is sufficient to kill microorganisms and pyrolyze organic contaminants. Although the reprocessing of plastics also utilizes sufficient

heat to destroy microorganisms, it is not sufficient to pyrolyze all organic contaminants and postconsumer recycled plastics are not generally used in food contact applications (Bugusu and Marsh, 2007).

Plastic food containers cannot be recycled to make new food containers for sanitation reasons. But plastics used in the food industry can be recycled for other uses if they can be separated easily. For example, recycled PET plastic is used for carpet backing, fibrefill for sleeping bags or ski jackets, fibre glass tubs and shower stalls, paintbrush and appliance handles, floor tiles, and more. Recycled HDPE plastic is used for such things as trashcans, flowerpots, traffic cones and plastic "lumber" for park benches, railroad ties, boat docks, and fences. Polystyrene can be recycled, but systems for doing this are not well established.

Rigid plastic containers must be identified by code numbers to assist in sorting for recycling (Greenindustries):

- #1 = PET (polyethylene terephthalate),
- #2 = HDPE (high density polyethylene),
- #3 = PVC (polyvinyl chloride),
- #4 = LDPE (low density polyethylene),
- #5 = P/P (polypropylene),
- #6 = P/S (polystyrene),
- #7 = other, including multi-layer.

Trends in modern packaging :

Today's packaging has evolved to meet the rigorous demands which are placed upon it by the product, the distribution network and customer expectation. This requires the use of modern technology and materials. Considering the interaction between packaging and the environment, it is important to improve the effectiveness of the packaging materials and the packaging systems, combined with minimized environmental impacts at all stages of the materials lifecycle (Levy, 1993).

In India, little innovation happens in packaging. This is due to the belief that the consumer will not pay more for packaging. This however, is a misconception. Examples include pumps for liquid soaps and moisturisers. The consumer is willing to accept change and try different things. It is for marketers and packaging experts to identify and drive innovations in the country.

There is an example which shows collaboration between marketing and production that created a revolution. Initially when shampoos were too expensive to penetrate the Indian market, the Rs.1 sachet revolution completely transformed the shampoo market as well as consumer base for ever. Thus, all it needs is a belief in innovations and a will to drive change (Parida, 2012).

Technology advancements :

As our society moves towards environmental

conservation, an aged population and highly networked information, the packaging industry is now required to review the social significance of packaging for development and improvement in harmony with society. Our need for food safety and reassurance, environmental consideration, and universal packaging design is now increasing more than ever. Given these circumstances, there is a growing tendency to consider the social and environmental compatibility of packaging among consumers as well as among people of industry, government agencies, and academic circles.

The 21st century is globally called the century of the environment. It is becoming very important to convert our present society systems based on mass production, consumption and waste into a recycling- oriented society system based on recycling and reuse. Work on the so-called 3Rs. (Recycle, Reuse, and Reduce) has already begun in packaging and other industries. The participation of local municipalities and consumers as well as people in industry is extremely vital in addressing these tasks.

There has been a lot of excitement around integration of new technologies. Buzz words still pop up everywhere: from smart packaging to multi-sensual packaging, from augmented reality to social media. One intention behind many of those new advancements, ofcourse, is to bring hope to increase the stimuli and create more purchasing responses (Stroh, 2014).

Technologies for highly functional packages :

There are many highly-functional packages developed particularly for food safety and reassurance.

First, in paper manufacture and paper boards, the development or improvement of technologies is advancing for producing paper containers which can be used for liquid, replacing conventional cans, bottles, and plastic bottles, as well as for producing paper-made cushion materials, paper-laminated cans, heat-insulating paper cup, paper containers water-proof-processed at edge faces, non-staple cardboards, pulp molds, and micro flute packaging. In transport packaging, functional cardboard is under development including cardboard that is recyclable, excludes moisture, conducts electricity, and is waterproof, corrosion proof, and insect proof.

Second, the development of technologies concerned with food safety and reassurance is remarkable in plastics. Representative technologies relate to active and intelligent packages. The active package itself reacts with the environment to change its attributes, thus improving the quality, safety, expiration date, and usability of packaged contents. The intelligent package has mechanical, electrical or scientific monitoring and is able to display changes in the quality of its packaged contents over time. The technological development or improvement of packaging is advancing with light-blocking film, transparent and evaporated film, nano-composites, passive packages, microwavable containers,

retort-related containers, and more.

Third, in metal products, an embossed can has been developed which has a rugged part on the can body to make it distinctive in terms of both design and printing. In addition, the developed products include resin laminated cans, diamond-shaped pattern cans, and re-sealable cans.

Fourth, in glass products, the representative packages are ultra-lightweight bottles developed as a container friendly to the environment and compatible with our recycling society, and UV-cut transparent bottles that protect their contents by blocking harmful ultraviolet rays. The development of technologies for these packages is still progressing. The greatest attention in this field, however, is focused on the manufacture of bottles using cullet made from recycled broken bottles with a ratio of over 90%.

The advancement or improvement of other packaging technologies is now under way to respond to the three streams of environmental conservation, considering seniors and disabled people, and food safety and reassurance. In particular, further improvement has been made in the technologies of the existing aseptic fill system, foreign-matter-detection, soft-X-ray inspection, marking, in-mold labels, in-line blow fill, shrinklabels, and blow-off.

Automation in packaging industry :

Another big transformation, which is prominent in the industry, is the move towards automation. Even the smaller players, who are not able to fully automate their production, are going for semi-automatic machines.

Industry players unanimously said that the adoption of China manufactured machines has proved to be a major advantage for them. These machines have much better technology which makes them more efficient than Indian machines. This has helped to cut back on labour which sometimes is tough to get. With better technology and ever increasing demand, the players are certain about the bright future of the industry. It is one of the safest industries to operate in as there always will be requirement of packaging solutions.

Post-sale influence -disposal of packaging wastes :

Packaging becomes more influential with extended usage of a product. The issues of convenience, hygiene and safety come into play to a larger extent. Producers have responded through the development of packages that are particularly useful for extended or repeated use or where a long shelf-life is desirable (e.g. multi-serving juice packs or long-life milk). Moreover, because of the cost saving, consumers prefer larger sizes of packages when the price per unit becomes smaller.

However, research not only suggests that the bigger the size of the package, the more the consumer buys, but also suggests that the bigger the size of the package, the more the

consumer uses. The usage volume is also found to increase when the price per unit becomes smaller.

For products with a long shelf-life, the issue of storage is important post sale in both functional and marketing respects. From a functional perspective, packaging is often part of the usage/consumption experience. Not only is it a means of providing necessary information, but it can also form part of the actual product and provides functional benefits (e.g. being easy to use, fitting into storage space, etc.). Some examples from different product categories which highlight the functional benefits from single to repeat usage come from packaging and product design to suit repeated and/or convenience use (e.g. Toilet duck, Dulux paint pod, Sellotape with dispensers, Febreze air fresheners, and easy to use super glue and weed killers).

In contrast, if packaging is unwieldy it can hamper the relationship with the brand. For instance if it breaks easily, does not fit in the fridge, can cut or injure the consumer, then clearly the experience with the product can be negative. This will result in a negative impact on the prospects of repeat purchase.

Landfill and composting techniques :

Many packaging materials degrade in modern landfills. Even naturally biodegradable products may not degrade in today's landfill because of the lack of air and moisture that bacteria need to thrive. Consequently, many packaging materials would be recognizable if dug up from a landfill 20 years in the future.

Experimental programmes are underway to demonstrate that packaging materials can be safely composted and used as a soil conditioner. Waste materials like cereal boxes, table scraps, juice cartons etc are mixed with sewage sludge to produce a soil conditioner that can be used with soil and fertilizer to improve plant growth.

Disposable materials used for food packaging :

Polystyrene foam has been used for fast-food packaging (sandwich "clam shells") and hot drink cups because it is lightweight, sanitary, recyclable, and insulates to keep foods hot while being cool to touch. Most polystyrene foam food-service products have never contained chlorofluorocarbons (CFCs) that have been associated with the depletion of the ozone layer.

Paper cups are lightweight and sanitary. But they don't insulate as good as polystyrene foam cups. When the beverages are hot, paper cups get too hot to hold. They need a micro-thin plastic lining (LDPE coating) so they would not soak through, making the paper non-recyclable. Also, they cost more than polystyrene foam.

Whether plastic or paper, food packaging usually is not recycled. Although polystyrene can be washed and

reprocessed for uses other than food containers, this practice has not yet proved economically profitable for widespread adoption. Both paper and plastic can be burned for energy recovery. The heavier weight LDPE-coated paperboard gives 31 per cent more heat energy compared to the lighter weight polystyrene.

Degradable plastic packages :

Degradable plastic packages decompose over time from exposure to light, hydrolysis, biological organisms such as fungi or bacteria, or some combination of environmental factors.

Currently, degradable plastics are used in such non-food items as garbage bags and disposable diapers. A food package must be a sufficient barrier to prevent contamination from the surrounding environment during the intended shelf life of the product. Also, the degradation or decomposition process must not release toxic products that could migrate into the food, making it unsafe. Standards for measuring acceptability of degradable plastics for use in the food industry currently are in development, and must be approved by the Food and Drug Administration.

Waste management :

Although no packaging is the best choice of all, it is not always practical. The need for any packaging should be evaluated in the research, design and marketing stages of a product. The goal should always be to reduce unnecessary packaging. The bulk delivery of solids and liquids to food industries and bulk retail sales from bins (including hardware products, produce, housewares, toys and other items) eliminate unnecessary packaging. Where the need for packaging exists, packaging should follow the 3R's hierarchy.

The 3R's packaging hierarchy does not include all possible options. To measure full environmental and/or economic impacts packaging must be subject to an agreed upon reputable and independent environmental life cycle analysis model as well as national testing protocols.

Reduce is the most important of the 3R's. Packaging should be reduced prior to the manufacturing stage, by designing and marketing products for the first "R". This means reducing the number of layers, materials and toxins at source.

In general order of hierarchy, reduction occurs by:

- Using less packaging and by meeting all or most of the 3R's hierarchy, including reuse and recycle
- Minimizing the number of materials used
- Minimizing the weight and volume of materials used
- Employing bulk delivery systems.
- Product concentration resulting in smaller packages

For regularly purchased FMCG products, consumers might seek only a limited amount of information when purchasing goods. External retrieval cues facilitate consumers'

abilities to retrieve a specific brand name into their short-term memory. Rather than scanning a pack for its brand name, consumers might use its distinctive color or its unique logo to help them retrieve the brand from their memory, and thereby recall its characteristics determined from their experience with previous purchases. However, this is only effective if the consumer has encoded the brand's characteristics in such a way that the pack design and logo have been categorized with the correct brand. This can be facilitated by salience when the package is brought home and only gradually used (e.g. a food item stored in a refrigerator until fully consumed). Over time, consumers will learn to associate particular pack designs with specific brands, reducing their search activity and saving them significant time when undertaking shopping trips.

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REFERENCES

- Bugusu, B.** and Marsh, K. (2007). Food packaging- roles, materials and environmental issues. *J. Food Sci.*, **72**(3) : 39-55.
- Chunawala, M.** and Venkat, S. (2013). Gauging the sustainability status. *Modern Packag. & Design*, **8**(6) : 28-29.
- EPA Environmental Protection Agency (U.S). (1995). Decision Maker's Guide to Solid Waste Management, Volume II. EPA 530-R-95-023.
- Levy, G.M.** (1993). Packaging in the environment. Blackie Academic & Professional, Glasgow.
- Mitra, A.** and Pandya, P. (2012). Assessing the Environmental Impact. *Modern Packag. & Design.*, **8**(2) : 30-32.
- Parida, A.** (2012). Habit change through packaging innovation. *Modern Packag. & Design*, **8**(2) : 52-53.
- Saha, N.C.** (2014). Consumer packaging. *Packaging India*, **46**(5):7.
- Surpur, B.** (2011). Facts & figures. *Packaging India*, **44**(1) : 65-66.

WEBLOGRAPHY

- Deliya** (2012). Consumer behavior towards the new packaging of FMCG products. *J. Res. in Commerce & Mgmt.*, **1**(11) : 199-200. Retrieved from http://www.abhinavjournal.com/images/Commerce_&_Management/Nov12/19.pdf.
- Dobson, P.** and Yadav, A. (2012). Packaging in a market economy: The economic and commercial role of packaging communication. *British Brands Group*. Retrieved from <http://www.britishbrandsgroup.org.uk/library/download/5093a34a8e9b4>.
- FPA Flexible Packaging Association (2011). *Flexible Packaging Lightweighting Strategies and Innovation*. Retrieved from http://www.flexpack.org/sustainable_packaging/FPA_Lightweighting_White_Paper.pdf.

Greendustries Packaging. (n.d). *Food Packaging Wastes and Environmental Impacts*. Retrieved from <http://www.greendustries.com/unido.pdf>

Massey University. (2012). *Introduction to Packaging*. Retrieved from <http://atlas.massey.ac.nz/courses/EP/Section%2016%20Introduction%20to%20Packaging.pdf>.

McKinsey. (2007). *The 'bird of gold': The rise of India's consumer market*. Retrieved from http://www.mckinsey.com/insights/asia-pacific/the_bird_of_gold.

Natchiappan, E.M. (2014). Indian packaging sector to reach \$32bn by 2025. *Packaging News* Jan 07. Retrieved from <http://www.packagingnews.co.uk/news/indian-packaging-sector-to-reach-32bn-by-2025/>.

Pongrácz, E. (1998). The environmental effects of packaging. Retrieved from <http://cc.oulu.fi/~pongraz/Licthes/ch9.htm>

Saha, N.C. (2014a). Packaging industry turnover to touch \$32 billion by 2020. *Economic Times* Jan 23. Retrieved from http://articles.economictimes.indiatimes.com/2014-01-23/news/46514149_1_packaging-industry-indian-institute-solid-waste.

Smithers Pira. (n.d). Retrieved from <https://www.smitherspira.com/services/distribution-testing/common-package-challenges/lightweighting-and-cost-avoidance>

Srikant, J. (2013). Retail, FMCG push Noida package Inc. *Economic Times* Apr 11. Retrieved from http://articles.economictimes.indiatimes.com/2013-04-11/news/38463426_1_food-packaging-packaging-industry-flexible-packaging

The Industry Council for Research on Packaging and the Environment. (n.d). *Packaging and sustainable development*. Retrieved from <http://businesscasestudies.co.uk/incpen/packaging-and-sustainable-development/the-environmental-impact-of-packaging.html#axzz3IwA0Nrr3>

The Industry Council for Research on Packaging and the Environment. (n.d). *Research on Social & Environmental Impact of Packaging*. Retrieved from <http://www.epa.gov/waste/conservesmm/sfmr/webinar4-incpen.pdf>

World Packaging Organisation (2008). *Packaging Technology*. Retrieved from www.worldpackaging.org/i4a/doclibrary/getfile.cfm?doc_id=15

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