

# An Innovation design for reusable shopping bags to optimize bag space

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**Abstract** – The paper intends to optimize and re-design the internal space of a shopping bag so as to minimize use of single-use polyethylene plastic bags and thus reduce the amount of plastic entering in to the landfill and our seas. Schools and college bags are made up of Polyester or Nylon that have separate compartment to carry books, stationary, laptop, files etc., However no such compartment have been used for shopping bags. Several Nation's have banned the use of plastic bags. In developing nation like India, some of the state government have stepped in and banned the use of plastic bags, still several states are looking for alternatives. In some research it has been found that alternatives bags which are known to be degradable/bio-degradable and compost-able are termed 'Environmentally friendly' but have similar environmental pollution as conventional polyethylene bag. The innovative design of bag is designed as per shopping culture, one such example is for shopping Vegetable/Fruits, sections are designed with Funnel like arrangements at top to facilitate the item to particular section of the grid. Similar design with cotton or jute bags can also be done but it will be less durable as compared to Nylon and Polyester.

**Key Words:** Plastic Bag, Environment, Landfill, Seas Shopping Bag, Nylon, Polyester, Pollution, Polyethylene, Cotton, Jute.

## 1. INTRODUCTION

Plastic consumption has become an integral part of our daily life, in this paper, chemical properties of plastics along with its Environment Impacts are discussed. Further the alternate to plastic bags are briefly discussed. The complication in the existing reusable bag for shopping for a particular item along with its methodology are broadly discussed providing an Ideal solution.

### 1.1 Chemical Properties of Plastics

The first completely synthetic plastics to be commercially produced were those made from phenol and formaldehyde. Leo Baekeland developed the chemical process in 1907 which created "Bakelite," the first synthetic plastic. As petroleum became major source of polymers the development of plastics through the 20th century accede-rated. Today, most synthetic plastics are produced from oil or natural gas. Even though the manufacture of most plastics begins with just carbon and hydrogen, other elements can be involved. Oxygen, chlorine, fluorine, nitrogen, silicon, phos-phorous, and sulfur are added to hydrocarbon chains to create certain plastics. There are two types of plastics Thermoplastics and Thermosets. Thermoplastics are those that can be continually and

repeatedly formed and reshaped with the application of heat and pressure. About 85% of all plastics produced are thermoplastics. Most recyclable plastics, such as polyethylene, polypropylene-lene, polystyrene, and polyvinyl chloride are thermoplastics. Thermosets are those that cannot be reshaped once they are formed. This is usually because those plastics have been cross-linked, and the cross-linked bonds cannot be broken. About 15% of all plastics produced are thermosets such as poly-ester, polyurethane, and epoxy resins.[1] Plastic shopping bags, carrier bags, or plastic grocery bags are a type of plastic bag used as shopping bags and made from various kinds of plastic. In use by consumers worldwide since the 1960s,[2] these bags are sometimes called single-use bags, referring to carrying items from a store/retail to a home. However, reuse for storage or trash is common, and modern plastic shopping bags. In recent decades, numerous countries have introduced legislation restricting the sale of plastic bags, in a bid to reduce littering and plastic pollution.[3,4,5,6] Plastics are produced from the waste products of oil refining. An analysis of the life cycle of plastic bags includes consideration of the environment impacts associated with the extraction of oil. The separation of products in the refining process, and the manufacturing of plastics. Plastic carry bags are generally made out of polyethylene.[7]

### 1.2 Environment Impacts due to Plastics

It can take between 400 and 1000 years for plastic to decompose.[8] The manufacture can add many tons of carbon and other toxic chemicals into the atmosphere.[9] Plastic products have become an integral part of our daily life, encouraging its production to cross 150 million tonnes per year globally. The utilisation of plastics ranges from toys to aircraft, from dolls to hosepipe from soft drink bottles to refrigerator. Packaging sector represents the single largest sector of plastics use and accounts for 35 percent of plastic consumption. There are no authentic figures on total generation of plastic waste in India are available, it is estimated to be approximately 5.6 million tonnes per annum (TPA), which is about 15,342 tonnes per day.[10] Thermoplastic or recyclable plastics contribute to about 80 per cent of total post-consumer plastic waste generated in India. Plastic bags are known to clog drains and thus hit urban sewage system. Choked drains provide excellent breeding grounds for mosquitoes, besides causing floods during monsoon. Due to indiscriminate dumping of plastic bag on land, toxic metals such as lead and cadmium pigments reach into underground water. Garbage mixed with plastic bags interfaces in waste processing facilities and causes problem in landfill operations. Since plastic bags do not undergo bacterial decomposition, land filling using plastic bags would mean preserving the poison forever.

Buried in landfill sites, plastic takes hundreds of years to degrade.[11] Maharashtra becomes 18<sup>th</sup> state to ban plastic bags in India. The government will be implementing the ban from the date of issues of notification, but has given traders, manufacturers and even consumers a time period of one month to dispose of the banned items in their possession.[12]

### 1.3 Alternate to Plastic bags and their Impacts

Other alternatives to plastic bags include High density polyethylene(HDPE) Bag, Low density polyethylene (LDPE) Bags, Green Bags (re-usable)bags, Light-weight bags like bio-degradable or compostable bags. But any replacement for plastic shopping bag, including paper, cotton and green bags,each have their own environmental impacts.Recent study in Australia it is found out that alternatives marked as ‘Environmentally Friendly’ bags, such as degradable or bio-degradable bags which are alternate to plastic bags has same impact on environment and Wildlife. Any replacement for plastic shopping bag, including paper, cotton and green bags, each have their own environmental impacts. This includes material use, water and energy consumption, marine impacts, greenhouse gas emission and litter.[13]Recently companies have worked to make bags more degradable. There are however two types of these bio-degradable bags. Oxo-biodegradable bags are those which break down in water and air ,but not in landfill. These type of degradable bags takes 6-18 months to break down. Other type of bags are called as Corn-made biodegradable bags do break down in landfills but not in water and air. As these breakdown they release methane a well known greenhouse gas that contributes further to climate change and global warming. This means that despite the attempt to make plastic bags better for the environment, if the bags are in certain places, they do not degrade, its only specific circumstances that they breakdown.[14]Research demonstrates that paper in landfills does not degrade or breakdown at a subsequently faster rate than plastic does. In fact nothing completely degrades in modern landfills because lack of water, light, oxygen and other important elements that are necessary for degradation process to be completed. A paper bag takes up more space than plastic bag in a landfill but because paper is recycled at a higher rate, saving space in landfills is less of an issue.[15] Cloth bags can be reused many times. However, cloth bags are not hygienic, like plastic bags. Research by Guelph Chemical Laboratories in Canada in 2008 Microbiological Study of Reusable Grocery Bags has shown that “re-usable grocery bags can become an active microbial habit and a breeding-ground for bacteria, yeast, mould and coli forms”. [16]All the bags have an impact. The best solution would be to use a cotton bag several hundred times, probably using it constantly for years. Avoid accepting a plastic bag unless you need one.[17]

### 1.4 Complication in Shopping Bags

The main issue with all the bags till now is that, all the bags are designed and manufactured providing same internal

space, till now there isn't a bag which has provided with compartment. The common problem with the bag is it is designed to carry quantity goods without a sorted type of design. If we provide a grid type arrangements inside the polyester bag with some-sort of funnel like arrangements it can eliminate purchasing of plastic bag for each an every goods, like for vegetables and fruits, etc. The reason why most of the alternative solution to plastic bags have been unsuccessful to replace the plastic bags till now it's because all have been changing material from outside to make it more environment friendly. But if we design the bag internally according to its use, we could eliminate purchasing of plastic bag for every items from the retailer. In this paper it is found out that to stop the throw away culture and to design a bag for Multi-purpose use we can adopt to a compartmentalised polyester bag for shopping vegetables, fruits, clothing, etc. Since polyester is a thermosetting material which makes it a permanent bag for any use. In India, shopping for vegetables and fruits specially in street market if we use a large size cotton bag, it is impossible to shop without using plastic, as we tend to avoid segregation by using plastic bag for each and every items. As all vegetables and fruits comes in different shape and size. It is impossible to purchase all vegetable and fruits in one bag without getting mixtures, hence we tend to use plastic bag for every vegetable and put it in our large size bag. By doing so we also litter a large of plastic bags into the environment. In the household these single-use plastic bag are used as bin-liners which latter adds up into the landfills. Hence we need a shopping bag which is capable to carry the vegetables alone, without using a separate bag externally. From the figure (1.1) its seen that the loading path of the items in that the conventional bag which carries the different items are Horizontally.

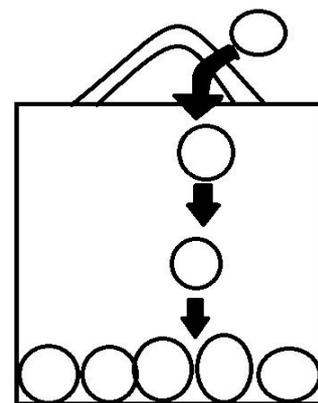
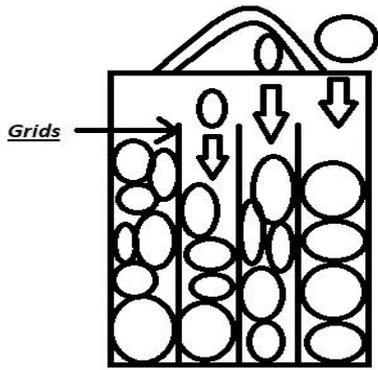


Fig -1: Loading path of objects in the Bag

## 2. MATERIALS AND METHOD

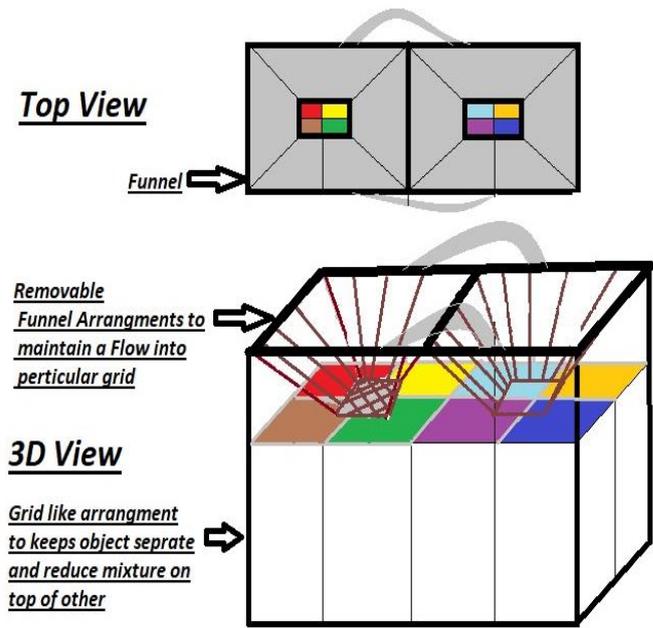
Therefore we need a bag which stores our items Vertically inside the bag instead of horizontally. If we add grids to re-usable bag, it will allow us to store the objects vertically, Hence the re-usable bag will be optimized from bottom till top by doing this the bags volume can be used till its full extent. As shown in Fig-2.



**Fig -2.1:** Loading path of objects in the Bag with Grids

Shopping for vegetables and fruits from streets we need a bag which has a funnel like sophisticated design at top, and grid arrangement at bottom to store the items. The strongest and most durable material that can be used is either Nylon or Polyester. We can use Cotton, Jute, Woven fabric or any other bio-degradable materials. But the stitching of the bag along with strength and durability is best in Nylon or Polyester bag. Using this sophisticated design to shopping bag it is possible to eliminate purchasing of plastic for each as every goods, as this bag already has a grid-like arrangements from inside to keep goods separated from each other. In order to make a re-usable bag and a permanent bag we should be using a thermosetting polymer such as polyester or Nylon.400D nylon, 500D nylon,600D polyester, 1050D nylon, 1680D polyester and 16oz canvas are some of the most commonly used fabrics in bag manufacturing. They are designers' favorites because these fabrics are well known for their good strength, durability and reasonable price. In a test conducted by Orient Bag manufacturers to check the Tensile strength of the various kind of fabric materials. The test used to is ASTM D 2261. In this they have done five tests per fabric to get the average data, the results proves that Although nylon and polyester fabrics look very similar, we commonly believe that nylon is stronger. This belief is also matching with the test result. When compared 1680D Polyester verses 1680D Nylon, it is found that Nylon is 1.4 times stronger than Polyester.500D Nylon is also about 1.4 times stronger than 600D Polyester.[18] Using a separate compartment at the bottom would allow us keep vegetables and fruits apart and allow us not to use plastic bag. In this bag the vegetables and fruits are stored vertically inside each and every grid. Instead of conventional bag, which stores vegetables and fruits horizontally. The top funnel like arrangements can be stitched using a Velcro around its periphery of the bag hence that makes it detachable once the bottom grids filled. The top quarter of the portion can be filled using the vegetables and fruits which are of bigger size and which don't require a

plastic bag for it. Such as leafy vegetables like Spinach, Kale, Broccoli, Cabbage and Fruits like Banana, Watermelon, Pineapple, etc. In the Fig 2.2 it is seen that the Top view and 3D view of the bag, in which the different grid are colored to show difference between each grids.



**Fig 2.2 – Top view and 3-D view of the bag.**

### 3. CONCLUSIONS

Instead of using conventional bags for shopping, if we use bags with internal grids, we can start to reduce no of bags consumption which will have a positive impact on the Environment. Hence if we start by reducing our bags consumption, it will ultimately reflect on litter waste. Which can ultimately reduce the flooding situations occurring during monsoon, where we can observe due to this throw-away culture the drainage gets choked due to plastic bags occasionally.

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