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## PLASTIC TRANSFORMATION INTO JEANS

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### Abstract:

Plastic consumption by humans have been increasing year by year and piling up a lot of plastic waste. Around 20 million tonnes of plastic is still being used currently. An average Indian uses 11kg of plastic per year and an American uses 109kg of plastic per year. In this current horrifying situation, clothing world has taken a surprise turn by transforming plastic into clothing apparels such as jeans, shoes, shirts, t-shirts, etc. This additive property of plastic is very advantageous in clothing industry such as increasing of water resistivity, removal of staining problem, increasing the wear and tear of the clothing material, durability of clothes. In this article we'll focus mainly on the plastic to clothing transformation, types of machineries being used for this production, how are the clothes being prepared, which all brands are using these ideas to reduce the wastage of plastic will all be summed up in this article.

**Keywords:** water resistivity, clothing transformations, staining problem, reduction of plastic waste.

### Introduction:

Plastic Pollution has become the biggest major issue in today's generation<sup>1</sup>. Growth of usage of plastic has been increasing rapidly by human beings due to which it is affecting our environment<sup>2-3</sup>. Plastic usually consists out of synthetic, semi-synthetic and organic polymers of higher molecular weight and complex structures present due to which it is non-biodegradable and non-soluble in solvents<sup>4-5</sup>. In this piece we'll see how the properties such as water resistivity<sup>6</sup>, surface abrasion<sup>7</sup>, garment construction<sup>8-9</sup>, stain-resistant and fire-resistant<sup>10-12</sup> are how effective and useful for us in the fashion industry and in our day-to-day lives.

### Methodology:

Plastic bottles undergo several processes to get transformed into a clothing apparel.

Collection of plastic bottles waste collected and then they are segregated out depending upon the colour of the PET bottles. The transparent bottles are then sorted out differently and are inserted inside the shredder which shreds the PET bottles & bottle caps into tiny shredded bits or plastic flakes. Shredding helps in removal of the leftover liquid inside the bottle and also improvising the quality of the plastic. Transparent tiny plastic flakes are valuable because, they can be dyed easily while coloured bottles is difficult. For removal of unnecessary materials such as bottle caps, labels & stickers are processed differently. These tiny flakes are added to water baths where the bottle caps are made of lighter plastic material due to which they float on top of the water bath and are collected and removed from the mixture. The next step is the shredded plastic is added into corrosive caustic soda bath wherein there is removal of stickers occurring more easily. The caustic soda bath must be handled carefully as it is corrosive in nature. Now the leftover plastic shred is added to oven and mixed/ with light coloured plastic to produce light shredded plastic material in the mixture. This mixture is then added to a rotatory drum where in it is kept for about 10 hours so that the shredded plastic dries out evenly and uniformly. After rotating drum mixture it added to the rotating screw wherein the shredded plastic is heated

up to 270°C and forced to go through tiny holes which resembles something like a shower head to create fibres. The fibres are fine, long and continuous strands or into thread like structure. The thread obtained is stretched and combined several times while exposed to heat so that it increases the bonding of the fibre material. After obtaining of the fibre they are torn apart again and again to obtain cotton ball fluff like material. Then, the material is boiled and is finally ready to be turned into yarn. At this point the fibre very closely resembles to wool. In the final steps, the fluff material is added to the carding process wherein the machine aligns all the fibre in the same direction and hence strengthening of bonded fibres added to the spinning machine that actually makes the yarn. Now the yarn can be intertwined into fabric completing its transformation from bottle to fabric material creating a useful product.

### Properties of Clothes:

1. **Water/Liquid Resistivity**
2. **Garment Construction**
3. **Surface Abrasion**
4. **Stain-Resistant**
5. **Fire-Resistant**

1. **Water Resistivity:** Natural or Synthetic fabrics which are coated with waterproofing material such as PVC, Silicon, Polyurethanes, elastomer, fluoropolymer. For instance waterproofing spray can help in maintaining the water resistivity of the fabric material. Durable water repellent coating is treated to the fabric material at the factories to make them resistive to water. Most factories applying treatments are fluoropolymer that are based on these applications which are quite thin and are not so effective. DWR is commonly used as combination with water resistive breathable fabrics such as Gore-Tex material to avoid the exterior layer of fabric from becoming soaked in water. This saturation is called 'Wetting Process' due to this it can reduce the garment's breathability and let water through easily. As the water repellent wears off over the time re-application of DWR is recommended when required.
2. **Garment Construction:** It is necessary to check how well the garment is designed and created but first we need to regulate if the seams are strong or if they tear apart easily. Seam strength is basically important for Flame Resistant and arc flash protection to ensure that body isn't exposed in anyway. It is also used to determine the wear and tear resistant on the body and sleeves.
3. **Surface Abrasion:** Abrasion means wearing away of any part of the material when rubbed against another surface. When surface abrasion occurs to a garment, its protective properties can become disturbed, especially in topically(surface) treated garments. Surface abrasion can lead to formation of "pills" which is caused by loose fibre ends that gather and cling to the fabric material and making it torn and worn out.
4. **Stain-Resistant:** Stain resistant qualities are somewhat permanent after being applied to fabric after manufacturing. The ability to resist stains, especially in a shirt, is important for obvious reasons such as food stains, blood stains, oil or grease stains. This property slowly loses away after excessive washing.
5. **Fire-Resistant:** In many dangerous jobs, flame resistant in clothing is one of the most important aspect. To increase durability and flame resistivity towards the clothes for that garments must inherent flames and the resistivity to flames should be a permanent part of fabric. If flame resistance coating is applied to the garment, it will upgrade the flame resistivity of the clothes hence making it non-durable.

6. **Staining Of Cloth Material:** PET is a common form of polyester, which can be used to dye with a class of dyes known as Disperse dyes. It is slightly soluble in water and works greatest on polyester when used with a transporter chemical. Without a carrier chemical, you can achieve only lighter shades on polyester material. Dyes that is made for use on cotton or wool will not work on PET and other forms of polyester fabric material.

## Results and Discussion:



Figure 1: Indicates the consumption of plastic waste by Americans

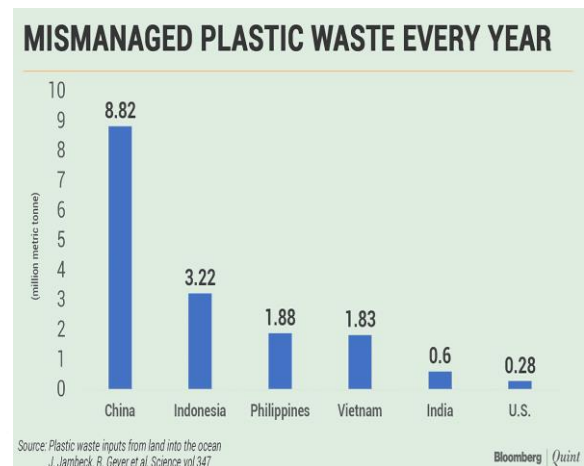


Figure2: Plastic waste produced by each country every year

- 100.7 billion plastic beverage bottles were used by citizens of U.S in 2014 or round about 315 bottles per person, according to the CRI
- 57% of those units were PET water bottles: 57.3 billion sold in 2014.
- The process of producing bottled water requires around 6 times as much water per bottle as there is in the container itself.
- 14% of all the litter comes from beverage containers.

## Conclusion:

A lot of Multi-National companies like Levi's, Adidas, Timberland, Ever Lane, Nike are some of the biggest clothing apparel companies which have invested in this idea of **"1 pair jeans from 8 plastic bottles"**

This is an iconic achievement for fashion industry that they are working towards betterment of the environment.

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