Plastic Recycling

Introduction to Problem

The initiative to 'recycle plastic products' began decades ago in the U.S. as the awareness of 'plastic waste' gained momentum resulting in 'symbols' printed onto plastic items with numeric codes originally intended for ease in sorting the various types of plastics for recycling. As an adjoin was the reverse vending practices implemented inland to capture plastic waste offering a 'cents' per item to those who select to gather such waste. It's primary objective, to decrease plastic pollution, however, was not and could not be fully implemented as there was no existing means by which to process the plastic once it was collected and separated.

Hence, it is an on going 'worldwide' problem that's gained attention of environmentalist, corporations and others concerned with diverting plastics from landfills and becoming unintended deposits of our oceans. It has been suggested that in 2015 there was an accumulation of 150 million metric tons found at sea. Plastics as floating 'oceanic' trash is on the rise globally as it is estimate that waterways and oceans content will reach 22 to 58 million tons each year which is comparative to a dump trucks content every one minute a day for one year. It is this outrageous approximation which alarms activist and 'illuminates' the campaign to curb plastic pollution.

COVID 19's Impact

This is not the world of yesterday nor are we faced restrictively with the contamination and pollution resultive of population growth. Today we are enthralled with the global impact of the COVID-19 virus. This pandemic having shut down countries is challenging households and each person with confinement in safety as a means of securing our health. While nesting, we are bound to consume greater volumes of food and supplies most of which entails some degree of 'plastic waste'. People aren't just spending using 'plastic', they are consuming food and products packaged in plastic wrappers of sort unlike, imaginary cash, this waste forming is real tangible matter and a real problem. In just 8 months, I'd guess the waste is surmounting to an unstated numeric factor impairing efforts to control it's staggering storage rate.

Plastics Global Impact

Plastic is an attractive pliable product as it is durable, lightweight, and an inexpensive material that is either synthetic or a bio-based product. It can be readily molded into various product(s) uses in a plethora of applications. The majority of plastic is derived from petroleum non-removable resource however, there are four specific notable means by which plastic is manufactured.

The use of crude oil, natural gas or coal serves as the basis and enabler of a complex mixture of thousands of compounds to be processed distinguished as the 'extraction of raw materials'. Then there is the 'refining process' for which crude oil is chemically turned into different petroleum products. Next is the 'polymerization' which encompasses the use of light olefin gases [gasoline] such as ethylene, propylene, butylene are converted into higher molecular weight hydrocarbons [polymers]. And lastly, businesses have a 'compounding processing' of varied blends of materials which are melted and blend with mixing to make formulations for plastics.

In consideration of the intended recycling of plastics we must also generate awareness that recycling decreases the need for fossil fuels, saves energy, landfill space, emissions of carbon dioxide and other greenhouse gases. As with most dynamic processes there is the plausible reduction of 'income' for those whom produce the necessary products to manufacture plastic goods. The intended goal of decreasing plastic pollution indirectly reduces the pressure on 'virgin materials' which would impact corporate revenue. This bought about the consideration of 'packaging' innovation making use of variations of plastic which can generously be 'recycled' without succumbing to the in-house politics of businesses who depend upon plastic income.

This was evident during the public imposed 'icon' implementation for recyclable items and return deposit fees provided decades ago which most assumed meant that those very containers where being processed and reused and not sold and sent to global destinations for storage and destruction. For developed countries, shipping cost to China was cheap and wise as provision onboard returning empty containers was effective. It became a trade holding a value of $24 billion a year as it was asserted to have been easier to ship around the globe than process within the U.S..

In the beginning, there was no foreseen reason to collect plastic waste unless someone had a plan for use and were willing to buy it and actually commit to the reuse process. With this in mind, we must also acknowledge that up until 2017, China had been the 'primary' as the world's biggest importer of plastic scrap. It seemed manufacturing rates were cheaper there and thus Chinese factories consumed much of the worlds resulting plastic and pulp. China's determinant to recycle further necessitated the full use of 'coal' mining which had become a

biologically and environmentally hazardous practice. Their ability to convert coal into chemicals used directly to produce plastics through coal - to - methanol and then methanol - to - olefins goes against present day global initiatives to reduce greenhouse gas emissions and air pollutants.

China has since restricted it's uptake as an imported good. This fractured relationship sent countries seeking a new option for their plastic waste collection. In fact, President Trump renewed the 'Federal Marine Debris' program while in office which is currently reflecting on plastic history and approaches to eliminate present day waste.

Suggested Recycling

Recovering waste or scraps of plastic and reprocessing the materials into functional and useful goods/products. I have captured the recycle system into a five phase process.

Five Step Process

1. The recycling systems begins with the access to containers of used plastic good either by recycling bins or redistribution of 'trash' isolating plastic.

2. The recycling system after collection is grounded in the ability to sort the 'types' of plastic. They must be identified and separated. The remaining forms are put through proper washing or each items which are readily reusable. This ensures that each is free of all contaminants.

3. They are next resized primarily through use of cutting or shredding them into flakes.

4. The finished flakes are compounded after having become granulated plastic waste into small particles.

5. Melting down plastics directly into a new shape or shredding into flakes then melting down before and bring processed into granulates.

Processors are required at some point to also test particles to determine their quality and class. Accomplishing this is in the use of rather or not they sink or float. Floaters are lighter weight or less dense and sinkers are dense of consume heavier plastics. An analysis of plastics is further indicated with observation of melting points and color change in heating.

After grinding the final plastic particles, they are smashed and melted together into plastic pellets with their a-liken materials. The compound 'melt' is used in the production of other plastic products.

Types of Recyclable Plastics: CHART 1

PS Polystyrene :	foam hot drinks	plastic cutlery	containers
PP Polypropylene:	lunch boxes	take-out containers	ice cream
LDPE Low density Poly-Ethylene :	garbage bins	bags	
PVC Plasticized Polyvinyl Chloride or Poly-vinylcholoride :	cordial juice squeezed bottles		
HDPE High Density Polyethylene :	shampoo containers	milk bottles	
PET Polyethylene terephthalate :	fruit juice	soft drink bottles	

Facilities Methods and Outcomes Plastic Recycled: CHART 2

*melt and dissolve within chemical solution
recycled plastic is transformed into less-valuable products
depolymerization breaks down polyester & polystyrene
pyrolsis turns mixed plastic into 'naphta' which can be cracked into 'petrochemicals & plastics'
pyrolsis = polystyrene = starting material 'styrene'

Problems With Recycling

Globally, there are problems in direct association of 'plastic recycling' which has hindered the ability to reduce plastic pollution and indirectly use of virgin chemicals in plastic manufacturing. At the forefront of these issues is the common knowledge of recyclables having been dumped in landfills, incinerated, or left piling up in ports across the world. There the direct economic, environmental hazards affiliated with such matters. It is then transparent that mechanical separation is enabled yet, we find 'waste pickers' at the bottom of the ladder to deal with the issues with 'hands-on' approach to collection and separation intention. They are too consumed with the risk of healthcare conditions arising, subjection to ridicule of nature, and low wage benefit.

The onset of our environmentalist and oceanic opportunist discovering the volume of plastic waste scattered within our waterways encouraged conversations and early action toward identifying the varied types of products which could be readily recycled yet, it failed to truthfully engage in the business of such action. Representatives had bulk plastic garbage stored in remote places for recycling and reuse but it was a process not fully overwhelming the minds of corporate leaders. As with lucrative big businesses committed to the business of buying and selling, the loss in revenue to 'recycling' initiatives were not sacrificial from the 'virgin chemicals', plastic products, nor the oil required in manufacturing.

The mind set to 'promote and build' such businesses could not be defeated. This resistence created a low key 'great divide' within the recycling system limiting use of the collected plastic and limiting research or the simple plight for intellectual assistance to formulate a strategy, a solid plan as to how best burn, melt, or chemically meld the plastic items for reuse worldwide. Until recently, the determination to prevent pollution of our oceans had not been a think tank topic and hence, lacked the level of support required to 'successfully' shatter country recycle culture codes and waste redistribution.

Problems with Plastics

Both State and Global Laws for Recycling Objectives

The intelligence of recycle care of plastics had to address the ability to 'contaminate' the process as it recognized the sense of 'mixed plastics' and container residues which are hard to remove. The materials used: dyes , heavy metals, pharmaceuticals and biodegradable plastics can potentially contaminate an entire batch of petroleum based plastics. The global uptake for such initiatives and the interested bodies had to enforce methods of identifying

those developed plastic products by their specified forms as each has a 'specific' means of melting for reuse which must be applied.

Before most countries could each reach this recycling phase, as they are not as developed as the United States or Europe, they each have to be made aware of the oceanic pollution and take account for their share in this international nightmare. It has been noted that while some cultures have established infrastructures which detail the needs for formalized systems to handle their waste, there are those developing countries which have not. These are our growing economy's with growing populations and middle classes that can afford 'more' or most food items and material goods grounded in the use of 'plastic'. They too are shocked into the realities of consumption and waste patterns of their citizens. International communities which suffer from undeveloped formalized waste systems have become global polluters. And as with most continents, they too have the responsibility to control, adopt and implement laws that formally address such matters.

One such example was found in that of India having a Per Capita 'on the rise' middle class with an increase in plastic and decrease in garbage collection habits in comparison to other nations. Within it's borders use of incineration and open burning is on the rise however, such actions are a direct additive to the air and environmental pollution problems that currently plague most countries.

Manufacturing Initiatives / Changes

Present day consumer goods companies united with resin and chemical producers are hosting the manufacturing of such plastic items. They are willingly working to design better plastic products with the recycling component woven into use and reuse abilities. They are typically lighter weight as it is ease of recycle ability.

While most researchers are suggesting a shift in reusable recyclables within our economy, they are still facing the slump such decisions create for those chemical corporations and oil nations who have so heavily depended on such over extensions in use as 'income' potential. There is also the realism of plastic having limitations on the amount of times it can be recycled and dually the variety of recycling processes required as there are 1000's of plastic manufacturing formulas.

The current forum of activist are bound by commitment and acquired knowledge which will not easily disengage their unity. Instead, today we have waste management providers and others are unified to help activist and environmentalist fight plastic pollution in their collection processes.

China's Ban on Importing Recyclable Plastics

Those traveling across China's borders are subjected to searches for illegal smuggling of 'low-grade' plastic pellet containers. A direct result of a ban on importing such items and the an awareness of 'greed' amongst those who have financial gained from it's use within the country. The Chinese decision left California, United Kingdom, Australia and elsewhere scouring the world for new buyers. These buyers would become a host of Asian countries eager to earn revenue in anticipated recycling of such goods.

Currently, countries of southeastern Asia are struggling to manage higher volumes of plastic waste imported as the replacement buyers after China's shut it borders to U.S., Europe, and others from whom they'd had a relationship with for years. It has turned the recycling process of plastics into a 'global' trade in flux after this Chinese recyclables import policy took affect.

Along with the consumption of 'plastic' waste taken up by countries such as Malaysia, Thailand, Vietnam, and Taiwan, their communities are experiencing retention of contaminated supplies resulting in crop death, respiratory illness from remanent of burning plastic and the increase of organized crime surged in areas with great uptake. This reality has since resulted in these countries along with others such as India and Indonesia imposing restrictions on imported non-recyclable plastics including bans on inspections, freezes on new licenses, new taxes, fees and raids on illegal operations. All in an effort to curtail growth in micro-managing other countries waste products.

As there are few options in reducing the importation and shielding residents from exposure to biological harm, sending it back to it's originating country is not feasible as there is no tracking system. Americans and Europeans are said to be equal as global citizens in trafficking of their inherent waste.

Suggested Packaging Innovation & Changes

a. mimic milk and water as refillable containers within retail outlets for some products
b. heavy cardboard containers with liners[AL] and plastic snaps and seals for spillage issues
c. use of plastics can be cut by 47% reduction using other solutions
d. elimination of unnecessary plastics
e. composting and substitution of different materials paper bags for shopping bags 17%

Plastic Innovation

Coca Cola Pepsi Co and Unilever are a sample of companies using recycled materials in their packaging. They have committed to up to 50% in some cases. There is also the efforts toward chemical recycling that recover their original raw materials to be remade into high quality resins.

Future has slated a fracture of plastic recycled products for use in "plastic parkways'. This innovation is being driving by a Scottish company, MacRebur, who have specified the use of 20,000 plastic bottles for every ton of asphalt. It is kettle stirred and combined in a ration of 80% to 20% asphalt to plastic respectively. This is 60% stronger road surface and has life expectancy of 2 to 3 times longer.

Out there within our world is also the reality of recycled plastic becoming building material. As a recycled plastic waste item, it is strong, durable, and waterproof. These properties along with it's lightweight easy to mould texture, it becomes a viable construction good as building blocks. The mix of virgin and recycled plastics [colored PET bottles, polypropylene, polyethlene, and others waste stream materials] are adjusted through a 'rotomoulding' process and combined with hemp, sawdust, concrete and red mud.

Research Objectives

There is and are existing 'research' projects devoted to capturing a true global picture of the origin of the 'plastic pollution' we're experiencing. One in specific is focused upon five southeast Asian countries which are believed responsible for 60% of marine plastic waste. As they have economically evolved, so has their 'middle class' denoting the earlier suggestion that such conditions redefine the access to goods and services which encourage greater use of plastic. As with such insight, these are the assumed points of origin have strong consumption pattern changes along with supported growth. This increase in capital however, suggest a slope in services which should have be parallel to the economic increase to the infra-structure solutions to waste management and other services. Increased capital should aide as financial resource for entrepreneurs to develop collection, processing and other solutions.

Having recognized such redevelopment within these countries would have enabled Increase waste management systems and innovation regarding recycling and reuse 'bio-fence' to capture plastic as it floats down the river. Unlike other cultures who had to catch on to their problems after years of being abuse or lack of interpretation of the plastic pollution problem.

Hazardous Growth Potential Facts:

8.5% plastic production was recycled in U.S. 2018

50% of Plastics are thrown away just after a single use

Each year 100,000 marine animals and one million seabirds are killed by pollution

420 million tons of plastic manufactured globally

Est. to take 140 billion to reduce plastic pollution

Sneakers are part of the plastic problem

rural middle class of low income countries will double by 2040

Corporate Interest In Recycling Plastics

Under public pressure, plastic makers are increasingly looking to partner with companies to develop chemical recycling processes. There are companies committed to $1 billion to decrease plastic waste and develop management systems to improve recycling efforts. Below is a list of some of those committed senses of leadership.

Ellen MacArthur Foundation

American Beverage Association

Break Free From Plastic *environmental activist Greenpeace

Formed and alliance announced January 16th 2019

Chevron Berry Global Exxon Mobil Chemical Dow Co. Procter & Gamble

Shell Lyondell Basell Hong Kong based Ocean Recovery Alliance & others....

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