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From Vice President Desk

Dear Friends,

Season's Greetings. In this issue of IPI Journal, we will celebrate Earth Day and cover articles related to the "Make the Case" student competition on recycling and sustainability.

This is the second year of the competition, and more than fifty institutes participated from the sub-continent, with five shortlisted for the final presentation. It is inspiring to see the emerging thought process and solutions to make plastics recycled and sustainable with business justification. The issue of the journal has the final five papers.

We are honored to have interviewed Dr. Ajit Parulekar, Director of Goa Institute of Management, one of the organizers of "Make the Case," on his thoughts on the importance of competition and the role institutes can plan on sustainability.

Although the competition was successful, we had some challenges specific to sponsorship, and we see that depleting post-pandemic. I would encourage sponsoring events such as competitions of this nature to provide a platform for students to show their talent and share their thoughts.

I want to thank the Centre For Social Sensitivity and Action (CSSA), GIM, in collaboration with Commitments Accelerator for Plastic Pollution (CAPP), Ocean Recovery Alliance, and INDIAN PLASTICS INSTITUTE - IPI members who mentored, reviewed the papers, judges, and participated in the competition.

Happy Reading.

Kind Regards,

Sriman Banerjee
Vice President,
President Board, IPI

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Inside

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Leader's Speak

Interview for IPI Journal

Prof. Ajit Parulekar,
Director,
Goa Institute of Management

1. **Can you share a little about GIM, yourself and passion for sustainability?**

   Goa Institute of Management (GIM) is a leading business school focused on transforming and improving management education. GIM is rated among the top 4 Best B-Schools for the world in the Positive Impact Rating 2021. Established in 1993, the institute currently offers PGDM programs in Business Management, Health Care Management (HCM), Big-Data Analytics (BDA), Banking Insurance and Financial Services (BIFS), and Fellowship Program in Management (FPM).

   The focus on responsibility and sustainability form an important part of the Mission of GIM. The vision of GIM is to be a preeminent business school at the forefront of management education and research and to create transformative leaders focused on responsible, ethical and sustainable business practices. The mission of GIM is to develop responsible and agile leaders at the forefront of cutting-edge business practices. Drawing from the Mission and being a committed member of UN PRME, UN SDSN and GBSN, the institute undertakes several steps through its teaching, research, and outreach activities to create an impact and translate the vision into reality. We strongly believe that institutions which create, deliver or distribute value in society have a seminal role to play in societal transformation.

   I have been with the Goa Institute of Management from over 2 decades and have been the Director since 2017. I have a Masters in Pharmacy, in Marketing Management and in Health Economics Policy & Management; and a Ph.D. in Marketing. I have been passionate about sustainability from an early stage in life, probably initiated into sustainability by my father who was an oceanographer and marine biologist. At GIM, we practice and preach sustainability (economic, social and environmental) and have institutionalized several environmentally and socially friendly systems in employment, work culture, diversity & inclusion, waste management, energy & water conservation and several other ways in which we deal with ourselves and all our stakeholders. We strive to impress upon our students the value of good citizenship practices that help make the world a better place.

2. **What was the driving factor towards joining hands with like-minded organizations in the Make the Case competition?**

   Plastic pollution, which has become a menace in India, which affects our health (SDG 3), quality of drinking water (SDG 6) and threatens life on land (SDG 15) and below water (SDG 14). To address such grand challenges, a multi-sectoral approach is needed. Government and private organisations have to join hands to tackle the problem of plastic pollution and solid waste management. Taking this background into consideration, when Make the Case was conceptualised, the natural tendency was to adopt a multi stakeholder approach and collaborate with both academia and non -governmental organisations. The involvement of multiple collaborators instilled a practitioners approach to the problem as well as gave students a platform to interact with and be mentored by experts from both academia and private organisations.

3. **Is there an opportunity to embed environmental sustainability in the education curriculum?**

   We at GIM believe that our graduates must learn to see business as an instrument of social good, not as an instrument of maximizing shareholder value at the expense of society.

   Thus, we have made a conscious attempt in embedding sustainability issues in the curriculum. It includes not just environmental sustainability but the social sustainability aspects also. The course on Social Responsibility & Action (SRA) is designed to help address new expectations from managers. The classroom sessions help students understand the concept of responsibility and the challenges/ opportunities business faces in balancing profitability with societal wellbeing.

   The GiveGoa projects (which are undertaken by all our students across PGDM programs) will help students become sensitive to the circumstances and perspectives of market and non-market stakeholders of the business. As part of the SRA course, students are trained to be

carbon literate, to be alive to society challenges and to make decisions while addressing important business and social concerns. Through simulations and role plays they are sensitized towards economic, social and environmental sustainability.

4. **What are some of the key learnings over the last two seasons of the competition?**

   The major learning was expanding the dialogue among students, at a national level, on plastic pollution, solid waste management, responsible consumption and production and adopting a sustainability mindset.

   The national case study competition acted as the perfect platform for knowledge sharing on issues related to plastic pollution in India. It was also interesting to see students from different disciplines bring in varied perspectives to addressing the challenge posed in the competition.

   By participating in this kind of competition, students went through a journey of exploration, where they discovered and reached out to organisations, that are doing exemplary work in the domain of plastic waste reduction. This sensing journey helped students develop a deeper understanding of sustainability, the significance of sustainable development goals, solid waste management, circular economy, and the situation of plastic waste in India.

5. **There is a technical and management side of sustainability. What are your thoughts on Sustainability Management?**

   Sustainability is a mindset and way of life. Sustainability Management is an approach while technology is one of the means of improving sustainability through solutions like sustainable materials, better measurement of environmental impact of a product/service, and several other ways in which technology can improve sustainability. Sustainability management spans various areas including conservation & consumption reduction to behavioural change modification, measurement & analysis of impact to strategic planning for achieving sustainability.

Make The Case, a university-level student competition focused on Plastics Sustainability, Recycling & Waste Management, was conceptualized in 2020. The first virtual event was held in the spring of 2021. The competition focuses on evaluating the problem at its source and potential solutions that can be scaled up. The competition is organized and facilitated by the Centre For Social Sensitivity and Action (CSSA), GIM in collaboration with Commitments Accelerator for Plastic Pollution (CAPP), Ocean Recovery Alliance, and INDIAN PLASTICS INSTITUTE - IPI.

This year the finals of the Make The Case Season 2 competitions were held on 12th April 2022. There were three themes 1. An existing, proven project/program reduces plastic waste near a waterway, 2. A new/recent innovation for the industry to scale, 3. Identify a plastic waste problem in your locality: Suggest an innovative and sustainable solution

The participation was open to all institutes in the Indian Sub-continent. Out of 50+ teams, five teams made it to the finals and presented their case studies and solutions to the audience and the judges.

We want to congratulate the 2022 winning team - ChemoPlast from Birla Institute of Technology and Science, Pilani on the topic Ecosys, the first runner up team - Maurya from Indian Institute of Packaging - IIP, on the topic of Indian Pollution Control Association (IPCA), and the second runner up team - Plutonic from Central Institute of Plastics Engineering & Technology (CIPET), Bhaskaracharya College Of Applied Sciences Delhi University and Sardar Patel University, Vallabh Vidyanagar on the topic Bamboo house. A special prize was awarded to Team: Rescueco from North South University, Dhaka, for the topic Sonali Bag. We also extend our congratulations to all the teams who presented for the final event.

We want to thank judges Ms. Shalini Goyal Bhalla, Prof. Ajit Parulekar, Mr. Pankaj C Shah, and Mr. Sumantra Sen for their continued support.

The initial reviews were done by Dr. Radhakrishnan, Mr. Jayant Kamat, and Mr. Sumit Basu from IPI and Dr. Padmanabhan V, Dr. Prakash Singh, and Dr. Purvendu Sharma, Dr. Muneeb Ul Lateef Banday, Dr. Vishwesh E. Singbal, from GIM.

We also thank the working team - Mr. Rob Steir, Mr. Doug Woodring, Mr. Sriman Banerjee, Mr. Atul Kanuga, Mr. Soham Mehta, Dr. Sameer Joshi, Prof. Divya Singhal, and Prof. Sreerupa Sengupta, and Ms. Keerthana Girijan for all their inputs and effort to make this competition a success.

Birla Institute of Technology & Science (BITS), Pilani

Ecosys Cleaners: PVA Packaged Water-Soluble Capsule Cleaners

Team Chemoplast

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ABSTRACT

Plastic has extensive use in the packaging industry due to its unique properties. It is lightweight, has excellent strength, is inexpensive, and does not readily react to its surroundings. The problem begins when the end consumer discards plastic packaging. Most of it ends up in landfills, and reportedly less than 9 percent of the total plastic waste in these landfills gets recycled. A fraction of the remaining plastic is sent for incineration, which produces high carbon footprints, and the remaining plastic is left in landfills which ultimately litter the water bodies. It is high time for the packaging industry to shift to materials that have properties similar to plastics but are cleaner and greener. One such material is PVA (Polyvinyl Alcohol) — it has no odour, is non-toxic, and is grease, oil, and solvent resistant. It is malleable, flexible, and robust and acts as an excellent oxygen and odour barrier; most importantly, it is water-soluble. More and more initiatives are being taken up to implement PVA packaging. An example of one such initiative is Ecosys Cleaner which uses PVA film to package their concentrated cleaning solution, which can be directly dropped into a bottle containing water to make the cleaner.

Keywords: plastic, packaging waste, PVA

Abbreviations

PVA: Polyvinyl Alcohol, CPCB: Central Pollution Control Board, 5 R's: Refuse, Reduce, Reuse, Repurpose, Recycle

INTRODUCTION

Plastic packaging waste is a significant issue because plastics are lightweight, durable, decay-resistant, affordable, and moldable; they are a product of human creativity. Unfortunately, this advancement comes at a cost. Plastic packaging is incredibly wasteful and negatively influences the earth's ecosystem. Most plastic garbage is transferred to landfills or disposed of in the environment due to poor product design and a lack of political infrastructure. Only 9% of the 9.2 billion tons of plastic that has been manufactured has adequately been recycled [1]. Since plastic is not biodegradable, every single piece of it has remained on the globe. Plastic discarded or washed into the oceans is ingested by marine species, where it breaks down into microplastics. The plastic packaging sector is booming in India as India proves to be a large producer and a large marketplace for many commodities due to its growing population [2]. Hence plastic waste is also increasing. India's plastic waste generation has more than doubled in the last five years, with an average annual increase of 21.8 percent as of 2015-16. 1.589 million tons of plastic waste was generated, which grew to 3.059 million tons in 2018-19, and it further increased to 3.4 million tons of plastic in 2019-2020 [3].

Sumit Goyal and Prachi Bansal, co-founders of Ecosys Cleaners, realized this plastic packaging waste problem when they saw a famous beach littered with plastic waste in India. They both understood that the problem was not plastic but the gross misuse of this material. People have made it their habit to buy new rather than reuse old, which led Sumit and Prachi to the idea of Ecosys.

EXPERIMENTAL

The solution proposed for plastic packaging is based on the usage of cleaner alternatives to plastic, and in Ecosys's case, it is the use of PVA (Polyvinyl Alcohol).

Polyvinyl alcohol is a water-soluble synthetic polymer. PVA comes from the industrial processing of polyvinyl acetate (PVAc), which is then turned into chemical alcohol like methanol. Film formation, emulsification, and adhesion are all excellent uses for it. It is odourless, non-toxic, and resistant to grease, oil, and solvents. It's bendable but solid and flexible, and it works well as an odour and oxygen barrier.

PVA is already being used in many countries for packaging [4]. Still, the companies limit themselves to detergents, but there is potential to work on producing surface disinfectants, cleaners, and other products.

Steps Followed by Ecosys for Developing the Product:

Any product design starts with five basic steps: Idea generation, Feasibility studies, Preliminary studies, Final design, and Process Planning.

1. The product idea of Ecosys was to use PVA packaging films.

2. Since PVA is water-soluble, it serves our primary purpose of reducing waste generated by plastic bottles used for packaging cleaner products.
3. A recurring issue was the leakages found in the films designed by the Ecosys team. Hence, many designs had to be tried out to find the optimum configuration.
4. Finally, after several experiments, a cylindrical design of length 6 cm and thickness corresponding to each solution present inside was finalized. Simultaneously eco-friendly cleaners were developed.
5. After the final product design was ready, a mass-production unit in Mumbai, Maharashtra was setup.

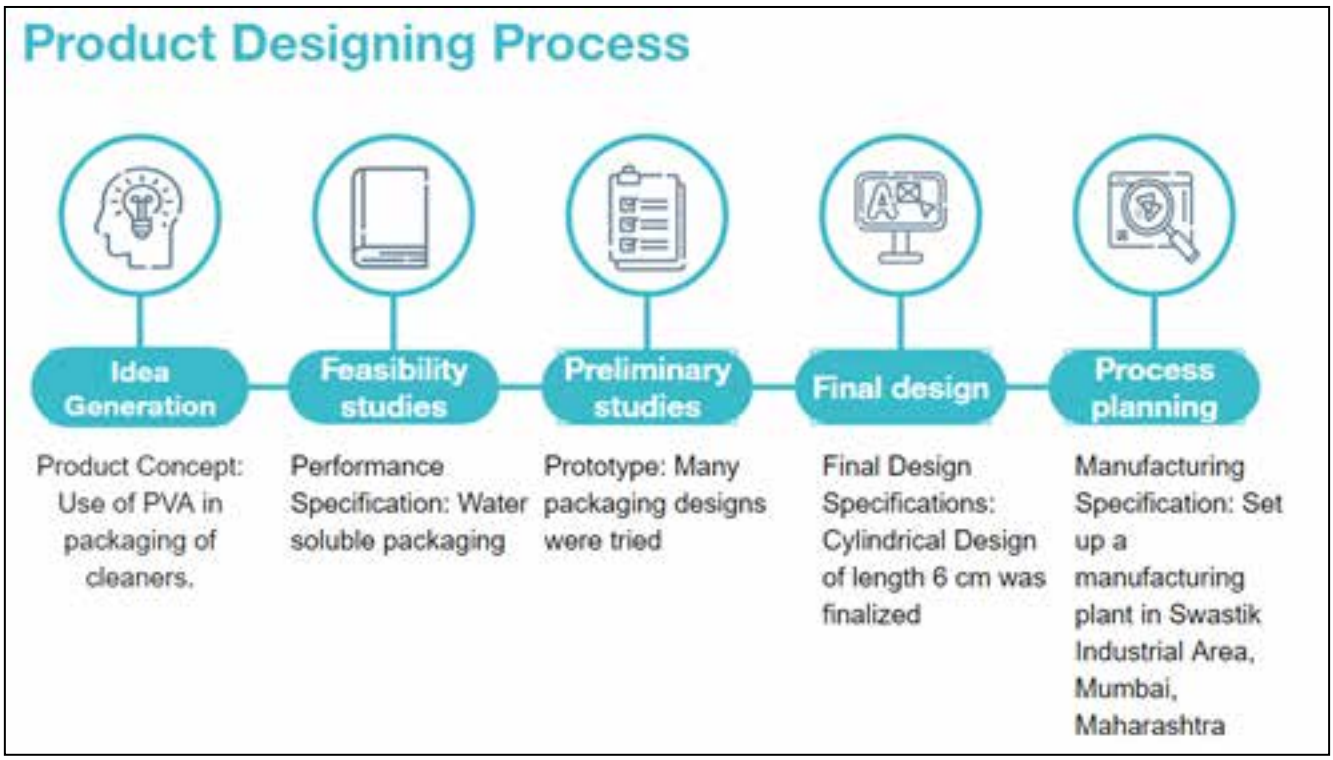

Figure 1: Product Designing Process of Ecosys

Challenges Faced:

The technical challenge was to find a suitable packaging design. The PVA film often leaked or caused spillage — unable to hold the liquid, the capsule frequently bursts open. After 18 months of experimentation, Ecosys launched a market-ready product with different PVA designs for other solutions.

The problem related to the consumer mindset is that the consumers failed to understand how the PVA products worked. The consumers were doubtful about the efficiency of the 10 ml concentrate diluted with a liter of water. Also, in many cases, the product is used by domestic helpers employed for cleaning and not the owner himself. The owner does not want to take the burden of explaining the new product to their helpers. Hence, it becomes challenging to make people transit from their current methods due to a lack of awareness.

Product Usage and its Ingredients:

Ecosys refills can be dissolved in any reusable plastic bottle to make the 1 litre of a solution, eliminating the need to buy new bottles and promoting 'refill and reuse.'

Ecosys cleaners, as of May 2022, contain the entire cleaning range: Glass Cleaner, Bathroom Cleaner, All-Purpose Cleaner, Floor Cleaner (Green Apple / Aloe Vera), and Air Freshener (Sea Myst). Table 1 presents their ingredient details:

Name of the product	Ingredients
Glass Cleaner	2-butoxyethanol, Alcohols, C8-10, ethoxylated, Alcohols, C12-C14, ethoxylated, sulfate, sodium salt, Mixture of 5-chloro-2-methyl-4-Isothiazolin-3-one and 2-methyl-2H-isothiazol-3-one
Bathroom Cleaner	Sodium dodecylbenzenesulfonate, Alcohols, C12-C14, ethoxylated, sulfate, sodium salt, Geraniol, Bronopol, Mixture of 5-chloro-2-methyl-4-Isothiazolin-3-one and 2-methyl-2H-isothiazol-3-one
All-Purpose Cleaner	Benzenesulfonic acid mono-C10-14-alkyl derives, sodium salts, Alcohols, C10-C14, ethoxylated, Tetrasodium ethylenediaminetetraacetate, Mixture of 5-chloro-2-methyl-4-Isothiazolin-3-one and 2-methyl-2H-isothiazol-3-one

Floor Cleaner	2-butoxyethanol, Fatty alcohol ethoxylated, 8 mol EO, 4-tert-butylcyclohexyl acetate, 2-tert-butylcyclohexyl acetate, Hexyl salicylate, d-Limonene, 3-p-cumenyl-2-methylpropionaldehyde, (Z)-3-hexenyl salicylate
Green Apple Floor Cleaner	2-butoxyethanol, Fatty alcohol ethoxylated, 8 mol EO, Isopentyl acetate
Aloe Vera Floor Cleaner	2-butoxyethanol, Fatty alcohol ethoxylated, 8 mol EO, 4-tert-butylcyclohexyl acetate, 2-tert-butylcyclohexyl acetate, Hexyl salicylate, d-Limonene, 3-p-cumenyl-2-methylpropionaldehyde, (Z)-3-hexenyl salicylate
Kitchen Cleaner	2-butoxyethanol, Dodecylbenzene sulfonic acid, compound with nitrilotriethanol, Fatty alcohol ethoxylated, N-(3-aminopropyl)-N-dodecylpropane-1, 3-diamine
Air Freshener	Citral, Coumarin, Alpha-cedrene, Isoeugenol

Table 1: List of Ecosys cleaners and their ingredients as of May 2022

Figure 2: Ecosys product portfolio as of May 2022

Advantages:

- **Savings on transportation and storage expenses by 70%:** The cleaning refills are compact and can be transported or stored in smaller spaces. They declutter and save space.
- **Environment friendly:** Replacing the concept of 'use and throw' with 'refill and reuse.' The refills completely dissolve in water without leaving any residue and thereby do not generate any additional plastic waste.
- **100% non-toxic chemicals:** The cleaning chemicals used are completely safe and do not harm humans or the environment.
- **Cost-effective by 80%:** The refills give quality output while being affordable compared to the market competitors.
- **Complete cleaning range:** Ecosys consists of the entire cleaning range for every need- Glass Cleaner, Bathroom Cleaner, All-Purpose Cleaner, Floor Cleaner, and Air Freshener.

RESULTS AND CONCLUSIONS

Market Coverage

Platforms on which the Ecosys products are available as of May 2022, apart from their official website, are:

1. Amazon
2. Jio Mart
3. Brown Living
4. OneGreen
5. Qtrove
6. LoopifyRefillable

Sumit believes that though the product was new and took time for consumers to learn and accept it, the product continued to convince the consumers. The startup churns out monthly sales of Rs 5 Lakhs [5]

Current Impact

In 2021, Ecosys successfully saved over two lakhs bottles from going to landfills by their sales in 5 months (May-September). Ecosys shared this data on their official Instagram handle under 'Ecosys Monthly Report.'

Future of Ecosys and Long-Term Impact

The Ecosys startup founders now plan to conceive new products such as laundry and dishwasher pods. They aim to expand their product range and reach more environmentally-conscious consumers who can contribute to the cause and help reduce pollution.

Ecosys aims to bring together big corporations. Such corporations have a large number of offices, plants, retail stores, etc. If the higher management team in such corporations decides to use only sustainable goods during their operations and for their employees, it can significantly impact the packaging industry. It would also motivate other relatively small corporations to follow. Also, the employees at these corporations would get used to sustainable products and are expected to eventually start using the same in their homes as these products are

almost equal in terms of cost. Hence sustainable products will reach retail consumers as well.

Replicability of the Project in India and Abroad

PVA packaging units can be opened in other metropolitan cities like Bangalore, Chennai, Kolkata, and Delhi. Furthermore, Delhi has one of the worst landfills in the world, the Ghazipur landfill. People in Delhi are negatively impacted, so they are more concerned about using eco-friendly products [6]. Hence there is a tremendous market opportunity for sustainable packaging in Delhi, and it is the need of the hour to lessen the carbon footprints. Additionally, the opening of firms that produce sustainable products may start a chain reaction that would encompass other manufacturing units to shift to eco-friendly packaging, contributing to decarbonization. Also, it is necessary to have a good team in the research and development department to discover biodegradable packaging solutions for other commodities in the market. This will help the organization grow while reducing carbon footprints. Since setting up such plants will require sizeable financial capital. A phased-out investment plan is needed to prevent economic issues such as cash shortage or losing viability because of inflated costs incurred due to unplanned expansion. Parallelly, retail consumers should be made aware of the product and its usability to make them comfortable adapting to the new change.

ACKNOWLEDGEMENT

We would sincerely like to thank Ms. Prachi Bansal for her help. We would also like to thank the organizers of the competition: IPI (Indian Plastic Institute), GIM (Goa Institute of Management), CAPP (Commitments Accelerator for Plastic Pollution), and Ocean Recovery Alliance for allowing us to work on this case study. Finally, we would like to pay our regards to IPI for giving us a chance to publish our case study.

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BRIEF BIOGRAPHY OF AUTHORS

Lakshya Jain: I am a sophomore at BITS Pilani, Pilani Campus, pursuing manufacturing engineering. I am a part of AIChE (American Institute of Chemical Engineering), ASCM (Association of Supply Chain Management), and REC (Renewable Energy Club). I developed deep interest in the field of plastics as I have a background in field of plastics. My family operates a small LDPE and HDPE recycling unit in Udaipur, Rajasthan as a part of our family business. I am majorly interested in solving the plastic sorting problem and would like to explore this field in greater depth as I discovered that inefficient plastic sorting acts as a bottleneck in the recycling industry.

Hatim Mustafa Merchant: My name is Hatim Mustafa Merchant, a student at Birla Institute of Technology and Science, Pilani. I am currently in my second year pursuing an Integrated MSc in Mathematics and BE in Chemical Engineering as my Dual Degree. I have a keen interest in Plastic Waste Management and have been following several initiatives taken up by the government and non-government organizations. I am also a member of the American Institute of Chemical Engineering (AIChE), where I met with the rest of my team. I hope to be a part of such innovative ideas and help the community in the best way possible.

Shrish Kuthe: I am an enthusiastic and passionate chemical engineering & M.Sc. biological sciences student at BITS Pilani with a vision to apply my knowledge of chemical processing techniques to innovate and refine existing processes for chemical upcycling of plastic waste. On-campus, I am a part of AIChE (American Institute of Chemical Engineering) and IIChE (Indian Institute of Chemical Engineering) and a volunteer at PARC, a social work organization for the underprivileged.

INDIAN INSTITUTE OF PACKAGING DELHI

Indian Pollution Control Association – Sustainability is our goal

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Abstract:

Despite significant development in social, economic, and environmental areas, Solid waste management systems in India have remained relatively unchanged. There's a need of the hour to work and improve the solid waste management system of the country to have sustainable livelihood. IPCA, Indian Pollution Control Association opens doors through various projects and initiatives for improvising the solid waste management system. Rag picking being one of the worst widely spread child labor violates the education and health of children. IPCA took few major steps towards their livelihood.

INTRODUCTION

SOLID WASTE MANAGEMENT AND ITS CHALLENGES

Solid waste management is a term that is used to refer to the process of collecting and treating solid wastes. It also offers solutions for recycling items that do not belong to garbage or trash. Waste management is all about how solid waste can be changed and used as a valuable resource. Over 9,500 tons per day (TPD) of garbage is generated per day in the city. Actual waste generation in the city could be much higher, as a bulk of the waste is managed by the informal sector.

Challenges to solid waste management

ENVIRONMENTAL CHALLENGES

An inefficient municipal solid waste management system may create serious negative environmental impacts like infectious diseases, land and water pollution, obstruction of drains and loss of biodiversity.

SOCIAL CHALLENGES

Lack of awareness among people regarding waste- (delete) proper disposal of solid waste- (add) is the major challenge and Insufficient recycling of plastic waste due to poor connection between waste collectors and stakeholder (recycling companies).

ECONOMICAL CHALLENGES

It comprises challenges like resources for scalability, insufficient no. of waste collection centers and recyclers, not enough machines to reduce workload.

Challenges in implementing SWM in India:

It is not possible to think of sustainable and environmentally friendly growth without thinking of waste management services in a developing country like India. Either it is large enterprises or small businesses, comprehensive cleaning is essential for any type of business. Hence, the role of waste management services remains an integral part in India. Managing waste is a tedious task, especially in a densely populated country like India. Lack of awareness about SWM and waste segregation is the great obstacle in implementing effective SWM. Increase in population & especially the development of megacities is making SWM in India a major problem. India relies on inadequate waste infrastructure, the informal sector and waste dumping & there is generally a lack of responsibility towards waste in the community.

Global scenario:

As per Data, our planet Earth is expecting Global waste to grow to (add) 3.40 billion tons by 2050 which is double the population. In order to maintain environment quality, public health and safety, proper solid waste management is important. There are some other major challenges related to effective SWM policies, availability of funds, appropriate technology selection and adequacy of trained people. Apart from this, there are also some major issues that require special attention such as poor participation of the public in SWM and lack of responsibilities toward waste inside society.

ABOUT IPCA:

Indian Pollution Control Association (IPCA) is a not-for- profit, non-government organization (NGO), established in the year 2001 by Mr. Ashish Jain with the support of Indian Institute of Technology, Delhi. It is registered under the Societies Registration Act 1860 and Section 80G of the Income Tax Act and enlisted with the Central Pollution Control Board at national level. Over the years, the organization has been successful in providing solid waste management solutions to corporate, industries, educational institutes and residential colonies. IPCA is dedicated to take care of the most important stakeholder in the waste management chain- Waste Collectors/ Rag Pickers. Residential colonies.

PROJECT MY 10KG PLASTIC- EPRO

This project helps in bringing together the EPR stakeholders, waste collector community and recyclers on a common forum to build a sustainable supply chain. It provides door to door collection of plastic waste from the target localities & provides a proper recycling system which results in decline in pressure on landfills. Under EPR awareness, (add) campaigns are organized for social awareness by social activities like clean up drives, street plays, group discussions.

Project RELISH:

Project RELISH (Recognizing and Empowering Local Initiatives for a Sustainable Habitat) is a pan- India project launched on 16 October 2020. Project RELISH, empowering local initiatives for a sustainable habitat, aims to recognize, appreciate, and bolster the efforts made by organizations and individuals working towards management of solid waste at grass root levels in India. Project strengthens such organizations by providing appropriate platforms for growing, sharing and evolving.

Key action domain of Project Relish are as follows:

1. Design a programme to develop a chain of change makers contributing to sustainable management of solid waste.
2. Inculcate a culture of collaborations and knowledge sharing for improving solid waste management.

PROJECT DOHBIN

Doh Bin project was initiated in DLFPhase IV, Gurgaon, in 2013 with the aim to sensitize the masses and increase their

involvement to bring about a better waste management system in Gurgaon through the simple act of segregating wet and dry waste through 'Twin bins system'. The prime objective of the project was to reduce waste and pressure on landfill sites and reduce cost on transportation.

To reduce workload of workers and to save cost on storage and transportation, Vertical Hydraulic Balers and new dry waste collecting centers were installed. The project was successful in imbibing the habit of source segregation amongst people and increasing per capita income of rag pickers.

PROJECT GARBAGE RECYCLING PROBLEM

IPCA started this first community - centric service Project called garbage recycling program in 2004.This project includes efficient and sustainable waste management, door to door collection of waste from households and nearby scientifically recycles it. It emphasized on an integral part of waste management; rag pickers, by providing training, capacity building programs. This project gave environmental, social and economic impacts improving the waste management system.

IPCA recycled the waste collected and generated a sustainable livelihood for waste collectors. IPCA enhanced the livelihood of ragpickers by providing sustainable income. They also set up health programs and education centers for ragpickers. IPCA is proudly carrying out this project till date by aiming, improving and working on all the possible ways for a successful waste management

RESULTS

82278MT of plastic waste was recycled or scientifically disposed of and 10885MT of MLP converted to energy at waste to energy plant through these project works.

IPCA partnered with 150 corporate houses, 125 recycling and co-processors as the part of My 10 Kg Plastic. Through the Garbage recycling program more than 20,000 rag pickers have sustainable livelihood and have increased their per capita income by 30%.

These project works resulted in behavioral and attitudinal change in households regarding waste segregation of waste-(delete), reducing pressure on landfills, reduced health risk of waste workers, acceptance towards adopting recycled products and decreasing the risk of contamination of water resources.

CONCLUSION

India has poor waste management which results in pressure on landfills and contamination of waterways. To solve these issues, it's important to educate people about the consequences of plastic pollution and provide them ideas to stop this problem and make a step towards a sustainable future.

Strong connection links should be made between ragpickers and stakeholders to maximize recycling processes and reduce loads on landfills. Ragpickers are known as the last line of defense and it's important to provide them benefits for the services they are providing.

Also, inadequate waste collecting centers and technology is also a major reason for plastic pollution.

IPCA is targeting all these problems through its project works and also aims to support other local initiatives and NGOs who are working for the same problem through project RELISH. We need more such initiatives to eradicate the problem of plastic waste from India and aim for sustainable livelihood.

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A sustainable method of using plastic waste for construction of plastic houses

Team Plutonic

Mridul Khanna, Anmol Malhotra And Ankush Koundal

ABSTRACT

Plastic can be a great asset or a curse to the environment depending upon the way it is used, disposed and handled. If truly seen, plastic is a misused treasure which if used properly, possesses numerous advantages. Being a versatile material with numerous applications in various industries, plastic truly is an irreplaceable material. But these advantages come at a great cost. We humans, being on the top of the food chain, are accustomed to over-exploit each and every thing that comes into our hands without thinking about what the consequences might be in the future. Consequently, one of the major disadvantages of plastic is large waste generation due to its persistence in an environment. In accordance with its long biodegradation cycle, a lot of plastic waste has been accumulated since the invention of plastic as there is no cost effective and environmentally sound way to deal with plastic waste, especially with our present waste disposal, management and treatment system. Fortunately, the team at 'Bamboo House India Ltd' has introduced an entirely new concept to overcome this problem. They use mixed recyclable plastic waste from different origins (particularly from dump yards) and of varying proportions to manufacture plastic houses. These plastic houses are cheap and affordable and at the same time, durable, fire and termite proof and can be installed with electrical appliances just like any other house constructed out of cement. Since this process uses plastic waste, the total cost of constructing the houses will be lower than that of conventional techniques and this process will also ensure environmental conservation.

Keywords- plastic waste, plastic houses, plastic pavements

Abbreviations- SDG: sustainable development goals, LDPE: Low Density Polyethylene, HDPE: High Density Polyethylene, PVC: Poly (vinyl chloride), PP: Polypropylene, PET: Polyethylene terephthalate, LLDPE: Linear low density polyethylene, MLP: Multi layered plastic

INTRODUCTION

Bamboo house India Ltd. was established in 2008 by Mr Prashant Lingam and his wife Mrs Aruna Lingam with the motive to replace other materials with bamboo in furniture and houses. After 3 years of hard work and constant experimenting with bamboo they finally constructed their first house completely made of bamboo on their terrace.

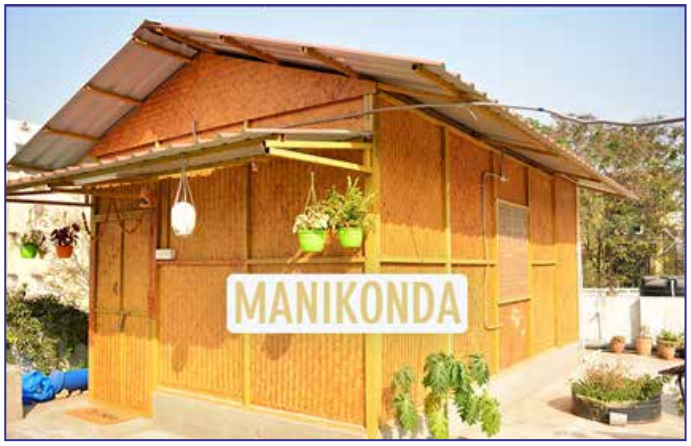

Fig. 1 Bamboo House

In 2012, Mr and Mrs Lingam were approached by Confederation of Indian Industry to construct a bamboo house on terrace in Ramanthapur which they successfully did in the month of December. Now their work has started gaining worldwide recognition. In 2014, Bamboo House India started their own website.

ISSUES ADDRESSED BY BAMBOO HOUSE INDIA

- Creating a business model for bamboo housing activity.
- Advocating on the issue of forest house restriction on bamboo.
- Providing livelihood opportunities for several underprivileged communities.
- Developing market for bamboo.
- Promoting the concept of 5Rs, viz Refuse-Reduce-Reuse-Repurpose-Recycle.
- Providing job opportunities to rag-pickers while also paying them fair wages for their efforts.
- Increasing awareness amongst people for proper use and disposal of plastic.
- Reducing the pile up of waste at dump yards.
- Supporting the country with Swachh Bharat Mission's agenda.

- Addressing climate change.

BUT WHY RECYCLED PLASTIC SHELTERS ?

The demand for plastics has increased from around 1.5 million metric tonnes to more than 350 million metric tonnes worldwide in the past 50 years. This also has increased the amount of plastic waste generated per year. Plastic is a versatile material that is used almost in every product, ranging from commodity materials to high-performance materials like in automobile bumpers, aerospace industries, etc. Plastics are non-biodegradable materials that may remain on earth for up to 4000-5000 years without showing any degradation signs. Since it is a cheap to manufacture material, it is used on a very large scale. Moreover, they show extreme chemical resistance which is the reason behind their slow degradation. Due to improper disposal practices and mismanagement of waste, sometimes litter and micro plastic is generated, for example due to flash floods, waste plastics can get into river bodies and then make their way into the oceans. This waste is broken down into smaller parts (micro plastics), and then consumed by fish and then the fish is consumed by humans again (this is more prominent in cities near coastal areas). Also, due to increased plastic consumption, many countries are facing difficulties in landfill spaces which leads to littering, causing air, water, and land pollution as a result of which it also enters the food chain. Recent studies show that almost 13 million metric tonnes of plastic waste end up in the ocean causing billions of dollars in the cleaning process. The most common plastics found in generated waste are HDPE, LDPE, LLDPE, PP, PET, and PVC. According to various surveys conducted around the world, it was found that the packaging sector contributed most towards waste generation from all 3 major sources of waste generation i.e. industries, agriculture and households out of which food packaging contributed around 31%, bottle caps around 15.5%, plastic bags around 11%, the remaining amount of waste was generated from other packaging materials that are not used in the food packaging sector.

By the year 2017, Bamboo House India had established themselves completely in the field of Bamboo furniture, houses, etc. However Mr. Lingam wanted to do more for the environment and the best way he could do so was by using the recyclable plastic waste (that ends up unused in dump-yards) to construct houses and pavements.

In this article, we will be discussing the process of making plastic houses and how these plastic houses differ from conventional houses in terms of their properties and cost. We will also talk about the environmental and social benefits of constructing these plastic houses.

EXPERIMENTAL

1. Collection

Plastic is collected from various direct and indirect sources, the majority of which comes from dump-yards. Rag pickers are the backbone of this operation since the majority of plastic is collected directly from them.

2. Sorting

Sorting of recyclable plastics occurs via both automated and manual methods. Manual methods are generally promoted over automated processes since it not only reduces machinery cost but also provides job opportunities. LDPE and MLPs are most widely used plastics in building these houses.

3. Size reduction and cleaning

Once sorted, these plastics are shred into small flakes and are then sent for cleaning where any kind of residue, adhesives, etc. are cleaned and removed.

4. Processing

The cleaned plastic waste is then sent for processing where, in order for the plastic houses to be durable and resistant, certain non-harmful fillers and additives are mixed. These additives and fillers improve house strength, prevent photodegradation, provide fire and termite resistance etc. without altering the original properties of the plastics

5. Recycling

Fig. 2 Recycled plastic roof

The processed plastic wastes is then molded into modules of desired shape and size using compression molding, other molding techniques may also be used in some cases, however. majority involves recycling via compression molding.

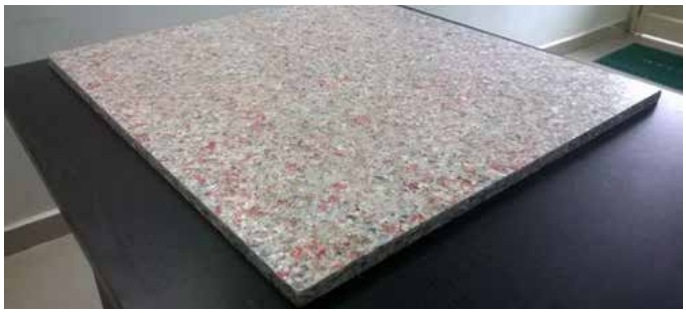

Fig. 3 Recycled plastic sheet

6. Construction Process

The framework is made entirely of metal, bamboo and cement which are responsible for high structural integrity, by acting as the backbone of the house. The plastic sheets, roofs, etc. are then properly attached onto this framework with the help of nuts, bolts, screws etc.

The plastic sheets are attached in such a way that there is no leakage of water, and no passage for undesired light. The construction process is very easy and does not require any skilled set of labour and thus, these houses can be assembled within month(s)

Fig. 4 Schematic representing entire procedure

ABOUT THE HOUSES

- 250 Sq. feet house costs approximately ₹ 1.5 lacs.
- The cost of 1 BHK house ranges from ₹ 90k to ₹ 4.1lacs, while 2BHK costs around ₹ 5 lacs.
- A 250 Sq. feet house can be made using 2.5 tonnes of plastic.
- Plastic waste is being molded into modules that, being made of compressed plastics, have high mechanical strength and don't need to be replaced for prolonged periods. Hence, plastic waste is removed from the environment forever without causing any harm.
- House is a cooler and cheaper alternative as compared to regular steel shelters. It possesses advantages like fireproof, water proof, borer proof, termite proof with zero maintenance cost. It can be disassembled and reassembled. And modules can be recycled.

Fig. 5 Inner view of plastic house

- Project can be implemented in slum areas where houses with better strength can be offered at affordable prices or in areas with high plastic waste accumulation. As of now, the initiative has been implemented to construct 2 Houses, 1 Covid isolation ward and a plastic pavement.

SOCIAL AND ENVIRONMENTAL IMPACT

- This Initiative helps us attain 8 SDGs

Fig. 6 SDGs covered by the Initiative

- Reduction in the amount of carelessly discarded plastic waste and hence, the amount of micro-plastics produced, leading to beautification of surroundings and decreasing the chances of micro plastics leaching into water bodies.
- The initiative holds the potential to provide job opportunities by increasing the demand for industries that separate plastic waste from other forms of waste.
- Reduction in the amount of plastic sent to landfills, which can reduce the amount of fruit flies, bugs, etc. leading to better sanitation.
- Reduction in greenhouse gas emissions, thereby bringing a significant impact on global warming and climate change.

UNIQUENESS OF THE INITIATIVE

- Addressing climate change.
- Providing job opportunities to rag pickers while also paying them fair wages for their efforts.
- No harmful fillers and additives used during construction of these houses.
- Increasing awareness among people for proper use and disposal of plastics.
- Reducing the pile-up of waste at dump-yards.
- Promoting the concept of the 5 R's, viz. Refuse-Reduce-Reuse-Repurpose-Recycle.
- Supporting the country with Swachh Bharat Mission's agenda.
- Life expectancy of a house is almost 20 years and just like any other domestic appliance, these recycled plastic modules can be assembled, disassembled and reassembled without any risk.

- No skilled labour is required for setting up these environment friendly, economically feasible houses that can be completely assembled within month(s).

CONCLUSION

The houses constructed possessed many properties like durability, fire resistance, termite resistance, etc. while being affordable at the same time. The houses can easily be assembled and disassembled and have a lifetime of 20 years after which the plastic used to create modules can be recycled to create modules again.

Construction of plastic houses can indirectly reduce the amount of unintended litter produced. This happens because the mixed plastic waste that is used to make the modules is collected from waste suppliers which involves less transportation of the plastic.

As mentioned earlier the process proposed utilises a large amount of plastic waste and the amount of waste utilised is very high compared to other plastic waste treatment methods proposed internationally. This will surely decrease the amount of waste going into landfills and incinerators, which will decrease the carbon footprint of the products as on incineration of the product a lot of greenhouse gases are evolved which are responsible for climate change. Also the open dry plastic waste present in unsanitary landfill can catch fire during the summers due to intense heat and high temperatures, this also contributes to GHG emissions which can be reduced by making plastic houses and pavements. Also if less waste is being sent to landfills, less land will be used for land filling, hence decreasing the land pollution/wastage and that area can be used for more important purposes.

ACKNOWLEDGMENT

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CONVERSION OF PLASTIC WASTE TO FUEL & ALLIED PRODUCTS

Team Wastend,
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Amrita Bhanja Chowdhury, Pallavi Mukherjee, Deepmoy Mukherjee, Trishit Datta

ABSTRACT:

Synthetic plastic production has reached 400 million tons worldwide. More than 50% of this figure is thrown in landfills or recycled. More than 15 million tons reach seas and oceans every year. There are several ways that plastic waste ends up in the ocean. Two-thirds of the waste is generated from land-based sources: litter left on the beach or washed down rivers and drains, and litter being dropped in towns and cities. The waste is also produced from industrial spills, badly managed landfill sites, by bins near the coast, or by rubbish being flushed down toilets. Most of these waste items are single-use plastics such as drink bottles, plastic bags, cotton bud sticks, sanitary items, and wet wipes. Incineration is also used to get rid of waste. However, U.S. emissions from plastic incineration reached 5.9 million metric tons of carbon dioxide in 2015, and they are expected to reach 49 million metric tons by 2030 and 91 million metric tons by 2050 (The Hidden Climate Polluter: Plastic Incineration—Global Alliance for Incinerator Alternatives, 2021). The burning of waste releases thousands of pollutants that affect people living near these incinerators. Furthermore, landfilling features a much lower climate impact than incineration. However, landfills are currently full, and there is no more space for waste accumulation. Landfilling contaminates soil and water, and also affects wildlife. Previously, the U.S. and other Western countries sent their contaminated waste to China, transferring the responsibility of waste management. In 2018, however, China closed its doors to the West's contaminated recycling.

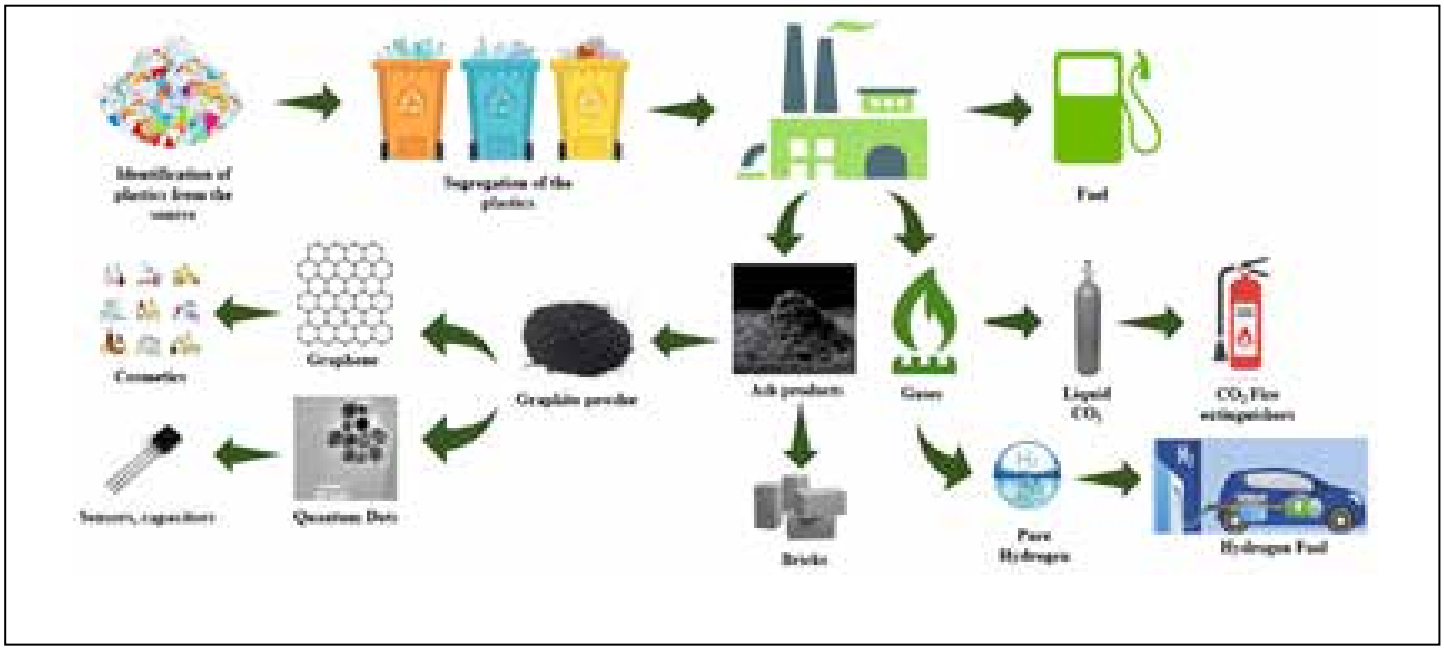
Almost 40% of the plastics are used in packaging and the plastic consumption is increasing every day. Like everything we buy is wrapped in plastics. We are a developing country and development comes at a cost, at the cost of the environment. People come out of poverty every day and that means they can consume more goods so there is an increase in consumption of plastics. According to our world data, from 1950 to 2017 9.2 million of plastics wastes were produced out of which 54.3% were dumped in landfill, 9.7% were incinerated and only 6.5% were recycled.

It has been concluded that waste plastic fuel has similar properties to diesel fuel and can be used instead of diesel. Our aim was to channelize the by-products that are produced while extracting oil from the plastic waste. The entire process is Zero-emission, and each ton of plastic waste is expected to produce approximately 750 litres of fuel (75%), 15% of synthetic gas (hydrocarbon and CO2) that can be channelized to produce hydrogen fuel and liquid CO2 is used up. 10% residual Char produced can be converted into graphene and quantum dots that have a vast use in cosmetics and electronics industries respectively.

INTRODUCTION:

India currently generates almost 26000 tonnes of plastic waste every day. Almost 50% of these waste is discarded after single use which actually litters the rivers, roads and form huge mounts in the dumping grounds. The balance plastics is left unattended which causes pollution.

So observed that Maharashtra, Tamil Nadu, Gujrat, west Bengal, Karnataka, UP and Telangana are the top contributor of the plastic dump and as per a survey conducted, it was observed that the food packaging, household care and personal hygiene products contributed heavily to the plastic problem. Well, I want say that there is nothing called waste in this world and we took the opportunity to solve the problem by implementing the technology that can provide a sustainable solution to the plastic waste. I believe that implementation of this technology in major industrial hubs can actually help in reducing a lot of tons of plastics waste annually.



The entire process is Zero-emission, and each ton of plastic waste is expected to produce approximately 750 litres of fuel (75%), 15% of synthetic gas (hydrocarbon and CO2) that can be channelized to produce hydrogen fuel and liquid CO2 is used up. 10% residual Char produced can be converted into graphene and quantum dots that have a vast use in cosmetics and electronics industries respectively.

EXPERIMENTAL / DATA COLLECTION TECHNIQUES

The plastic waste is cleaned, dried, and size reduced. It is converted into liquid fuel using fast pyrolysis. HDPE is extracted from milk jugs, yogurt tubs, cleaning product containers, and body wash bottles. PET is collected from food and mouthwash containers. PP is found in plastic food storage containers, car parts, thermal vests, yogurt containers, and disposable diapers. PS is found in cups, insulation, packing materials, egg cartons, and disposable dinnerware [9]. The collected plastic is shredded and crushed into small pieces (1 × 3 cm2) to reduce the volume of the plastic in the reactor. The plastic pieces are washed to remove any toxic materials. Catalyst needed was Zeolite Socony Mobil-5 (ZSM-5), which is a high-silica zeolite, widely used in the petroleum industry as a heterogeneous catalyst for hydrocarbon isomerization reactions but we have tried to use some inhouse catalysts to see if it works. The chosen catalyst is not yet a commercial catalyst. However, it must be dried in an oven to remove the moisture to below (5%) and further cracked to produce a much smaller particle size that will help in the reaction. The plastic-to-catalyst ratio is 10:3. The addition of the catalyst massively reduces the time needed for the process as well as the temperatures of the pyrolysis process, which results in an increase in the conversion rates for a wide range of polymers, which face significantly lower temperatures than they do during purely thermal pyrolysis. It also provides a high level of control in the distribution of the hydrocarbon products in LDPE, HDPE, PP, and PS pyrolysis.

Oil Yield from the various polymers

FEED STOCK	FEED STOCK QUANTITY (kg)	CATALYST (Kg)	YIELD EFFICIENCY (%)
HDPE	5	0.5	94
PET	5	0.5	70
PS	5	0.5	80
PP	5	0.5	60
PP+PET	5	0.5	67
PP+PS	5	0.5	75
MIXED	5	0.5	85.6-89.5

BUSINESS MODEL CANVAS

Generally, this kind of technology addressing a social impact may not necessarily be cost neutral. So, the skill needed to

deliver the social impact and the cost needed to do so needs to be considered. We performed a detail analysis and tried to include the commercial aspect and also the factors that help in creating the social impact under each component of business model canvas like key partnership, revenue stream etc.

SCALABILITY AND REPLICABILITY

Replication is not about copying and pasting exact replicates of the original model but rather a process of adapting the most relevant business components to the adopter's local context.

Replicability can be in two ways: Partnering with local bodies, where we can narrow our focus on only core operation of conversion of waste into products or manufacture customized tcd ??? plant and provide waste management solution to corporate client. But to scale up, there are certain challenges that we need to overcome like developing strong expertise and regulatory measures. Establishment of robust waste collection system, creating a recycled polymer-based product marketplace and risk of the product being black marketed or misused. Once the company has acquired all these resources right now, the solution would help curb the plastic problem we are eyeing at.

It is environmentally sustainable, socially inclusive and economically viable. The entire process is energy efficient and zero emission, we can help companies and government bodies to carry out circular economic practises.

In other words,

- It is a safe substitute and abundant compared to its counterpart.
- It comes in attractive cost and quality.
- Economic growth is important as it is an element of success for initiator and will lead to growth scale.
- Bulk of opportunities for start-ups.
- Investment Wealth creation.

CONCLUSIONS:

The main aim of this project was to create a circular economy by reducing and recovering the waste plastic and converting them to fuel and ancillary products thereby creating a positive environmental impact. The profitability involved the sale of converted fuel at a price lower than conventional fuel, providing waste management solution to Municipal Corporations, sale of by-products, segregated plastics to plastic recyclers. For any idea to be truly successful, it must be environmentally sustainable, socially inclusive, and at the same time, economically viable. With the entire process being energy efficient and with zero-emission, we believe that we can create a new equilibrium that helps companies & govt bodies to carry out circular economy practices. The fuel generated has Sulphur content, less than 18 ppm, which makes it a safe fuel for usage. Further reduction of sulphur content can be easily done keeping in mind of the new BS-VI emission norms for motor vehicles. The availability of cheaper fuel can help in nation's development. The model can be commercialized throughout the globe. It is not a geographical dependent model. The technology is full-proven. If all the facilities are available, then this problem can be handled in local level easily and there will be no point in transporting garbage from America to India. We believe if this technology goes elsewhere, it will definitely take a great shape. Every country needs fuels. We believe this is truly a sustainable solution and it can accelerate India's Mission to eradicate plastic waste and improve life on land and in the ocean.

Triple bottom line & impact:

By the Triple bottom line what we mean is the impact of the technology on social, environmental economic aspects. The impact created is multiprobe. Social capital is generated as the technology is community driven to make the community more plastic free. It aims to provide fuel access to famers and employment to marginalized people. Human capital is created by generating employment.

SDG Goals:

This technology provides recognition of very backbone of waste sector and provide people stable income, thus reducing economic inequality. A good start will be building sustainable cities and communities to responsibly consume plastics. It curbs the global climatic crisis by recovering plastics and thus stops it from polluting the marine and land ecosystem. Our technology aims to address the sustainable goals of quality education, affordable and clean energy, decent work and economic growth, industry, innovation and infrastructure, sustainable cities and communities, responsible cities and communities, responsible consumption and production, climate action, life below water, life on land and partnership for the goals was to create a circular economy by reducing and recovering the waste plastic and converting them to Poly fuel, creating a positive environmental impact. They achieved this by having the technical capability to convert waste plastic into poly-fuel and their ability to scale the plant's capacity with their patented technology gradually. The process involved mobilizing the community to engage them in Waste collection, converting plastic into poly-fuel using their TCD process, and finally selling the output to the customers and other industries.

ACKNOWLEDGMENT

We would also like to extend our sincere thanks to Commitment Accelerator for Plastic Pollution, Indian Plastic Institute, Ocean Recovery Alliance, Chellaram Foundation, and Goa Institute of Management for relaying this opportunity in the form of 'MAKE THE CASE COMPETITION' to the students. This was in a true sense, 'More than a Competition' which pushed us to

understand the grievous situation of Plastic Pollution across the globe and how eminent it is to address the same.

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Brief Biography of the authors

Amrita Bhanja Chowdhury: *I have completed my BSc graduation in physics honors. While surfing through various application based fields I came across the course of packaging technology which is probably one of the fastest growing industry in the world. I would like to do an internship to cultivate the various new ideas on packaging which I nurture in my mind and gather knowledge which in turn would equip me with all the technicalities to start a full time job and progress in future.*

Pallavi Mukherjee: *My name is Pallavi Mukherjee, born and brought up in Kolkata. After doing my graduation in chemistry I came across this packaging course where I thought my ideas would get results. An internship would help me to brush up my practical skills and also give me an opportunity to work in a professional environment. This exposure would highly uplift my various skills and give me a hand in hand experience about how a company functions it's pros and cons.*

Deepmoy Mukherjee: *First year student pursuing post graduate diploma in packaging from IIP KOLKATA, at graduation level where I had a paper in packaging that really make me turn my head and I decided to do specialization in this field that being said me being a team man I want to kick start my career with an internship to gather knowledge to start a fulltime job that involves technical knowledge and brain.*

Trishit Datta: *First year Post Graduate student pursuing Diploma in Packaging from Indian Institute of Packaging, Kolkata. Even though I am new in the field of packaging, I find this subject quite interesting! Well, that being said, I want to start my career in this field with an internship and then build enough experience and knowledge to start a full-time job. I am interested in technical and innovative type of work.*

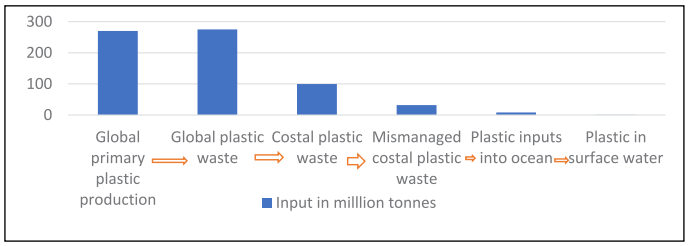
THE GREAT BUBBLE BARRIER

Team Wunderkinds
Keerthika N. B., Liyakath Ahamed M., Shanthini Devi A., Tharun J.

THE GREAT BUBBLE BARRIER

Since 1950 plastic production has reached a great height which indicates the success of plastics. The global production of plastics is growing exponentially. It's extremely remarkable properties made it useful for lots of purposes. Negligence by the people while using plastics. Households contribute to majority of these wastes which are poorly recycled and dumped in landfills. In the rarest of cases even natural disasters can be considered for plastic pollution. This pollution can have harmful effects on the habitat and organism living in both land and water sources.

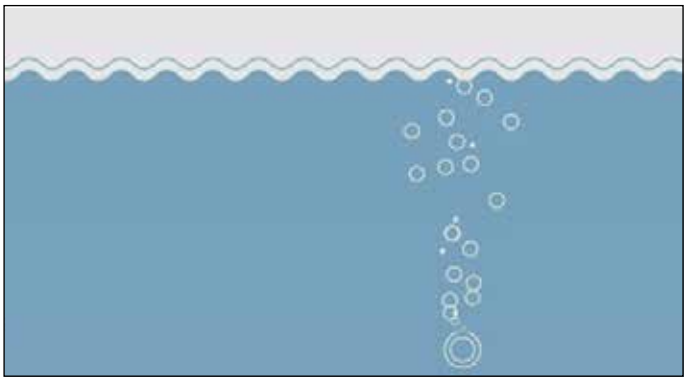
THE PATHWAY BY WHICH PLASTIC ENTERS OCEANS



The first step we need to take for solving this problem is to change our mindset. Plastics are nonbiodegradable materials, dumping them in lands and waters will only lead to accumulation of plastics on natural resources. On the other hand, if we use educate ourselves and others about the 3Rs, the plastic pollution is a problem solved rather than a problem in hand. Reducing the usage of plastics might be little difficult but reusing and recycling of plastics is much easier. The properties of plastics indicate they can be used many a times without getting damaged. Nowadays recycling factories are available in all regions. Another great method is the bubble barrier.

FIRST RUBBISH BARRIER:

World's first ever rubbish barrier made entirely out of bubble has been unveiled in Amsterdam. It was an innovative attempt to catch plastic waste before it enters to North Sea. This idea was proposed by a Dutch start up, the Amsterdam municipality and regional water board. The bubble barrier is an attempt to collect plastic waste, more specifically the tiny particles of plastics. The pieces that get collected by the barrier can be collected later. This was first applied in Westerdok canal in Amsterdam. Prototype models have shown that it can divert more than 80% of the waste floating and sunk in the water bodies. The bubble barrier uses compressed air to push out the plastic wastes present in water bodies.



INVENTORS OF BUBBLE BARRIER

The initiative bubble barrier is found by 3 Dutch friends namely Anne Eveleens, Fransis Zoet and Saskia Studu. They were discussing about the pollution over a beer time in Amsterdam. This brightened them about the curtain of bubbles raising the impurities in a liquid. Also as mentioned earlier, Amsterdam being a tourist city was facing a great threat to their ecology due to the pollution caused by plastic. Two teams came together to work on the above-mentioned idea, thereby they created the great bubble barrier. While considering the idea, it is something that should be implemented in every city.

WORKING OF BUBBLE BARRIER:

The idea is simple. A tube with holes is placed on the bottom of a river. Pumping air through the tube creates a bubble curtain. The air bubbles force plastics in the water to the surface, making them accessible for removal. This concept is used in the oil industry, the dredging industry and in the Dutch lock system. By placing the bubble barrier diagonally to the flow of a river, the power of the river forces debris to the banks of the river, where it can be easily removed from the water.

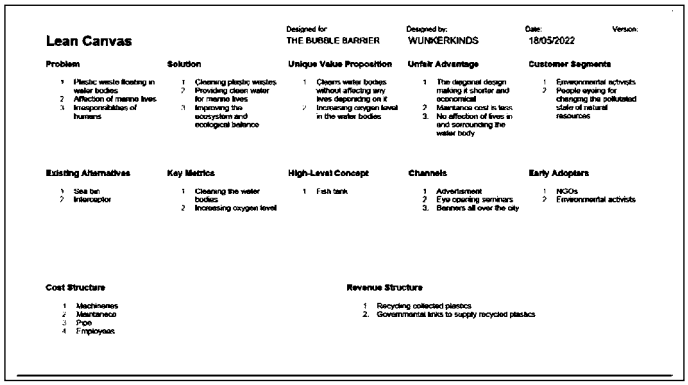
We are using a catchment system which is designed to work in line with the Bubble Barrier. The catchment system is always adapted to work with the existing infrastructure of each project. However, the combination of our Bubble Barrier with other catchment systems is also possible such as Seabin etc.

EFFECTIVENESS OF BUBBLE BARRIER:

Based on the results of the pilot at Deltares research institute, it has been calculated that the Great Bubble Barrier captures approximately 70-80% of top-surface floating plastic and 50% of plastic underwater.

The research says that, it can catch plastics with a size of 1mm and bigger, like granulate and styrofoam. In the pilot at Wervershoof, they are investigating whether we can catch microplastics measuring 20 micrometers up to 500 micrometers (0,5 millimeters).

BUSINESS MODEL:



BENEFITS OF BUBBLE BARRIER

BENEFITS TO SOCIETY:

Pollution due to plastic is faced by every society, the great bubble barrier removes 80% of plastics from the water bodies. Water bodies being the most affected part of the ecology due to pollution due to plastic will be solved in a large scale by the great bubble barrier. The bubble barrier achieves the clean water body by clearing as many flowing inland waterways in the world. By this way it improves the quality of water and organism living inside water. Improving the quality of water in turns improve quality of humans and other animals. The great bubble barrier filters plastic in the water bodies by forming bubble screens in rivers, thereby cleaning the river as well as not harming any living organism present in the river. The plastic filtered will be picked up there by available for further usage or recycling the plastic. This method shows the people visibly the amount of plastic dumped in water bodies making them aware of the crisis the world is facing right now. This will create a sense of awareness in people for littering plastics in water bodies as well as landfills. Which makes this much required one.

BENEFITS TO ENVIRONMENT:

The bubble barrier supports all weather conditions; it has high durability nature in it. This innovation has cleaned plastic waste under all weather conditions effectively without any damage faced. It has overcome all the weather conditions in the city is applied at the moment. The bubble barrier has achieved 80% plastic floating, which is a great percentage of plastics caught after the implementation of the plan. The bubble barrier cleans the water bodies from plastic present in them thereby promising a clean and safe water for citizens. It can catch plastics from the size of 1mm and sized larger, these plastics collected will be present at one side of the river bank waiting to be collected manually, this process cleans the river and provides safe environment for living organism and humans living in around the water bodies.

BENEFITS FOR THE ECONOMY:

The bubble barrier is generally a cheap and affordable device for cleansing the water bodies, it is economical and best for the environment also. Considering its application, the maintenance requires people with technical knowledge and for the collection of waste people residing near the water bodies will be ideal. In general, the maintenance and timely replacement of the equipment of the bubble barrier is cheap and affordable, but when handled by personal with lack of knowledge about the equipment handles frequent change in equipment will be demanded, so for the betterment of the machine and cost effectiveness technical people can be hired.
The collection of plastic waste from either side of the river will require people residing around the water bodies, who knows about the ecology and other factors involved in hand removal of the plastic.

CONCLUSION:

The plastic waste that is visibly seen floating around the rivers and other water bodies are proven dangerous to the marine lives living in it and also to people who depend on it. Innovations like the great bubble barrier serve as a great method to clean out the water bodies. These innovations serve as great help to environment and to the ecosystem. They cleanse the environment and shows the human community that there is a consequence to their every action. Considering bubble barrier, it not just cleans the environment and also increases the oxygen level and doesn't harm the marine lives in anyway by achieving the positives. The great bubble barrier is an excellent solution because the upside of the solution is that it doesn't have any notable downsides. Ultimately the cleaning is done and positively the lives depending on the water bodies are not affected.

TEAMMEMBERS:

Keerthika N. B. – The leader of the team who supports and always eyes for the success and takes decision for the team's betterment.
Liyakath Ahamed M. – The technical support for the team who made every vision and idea of the team into results and is the key to team's success.
Shanthini Devi A. – The brain of the team who always eyes to succeed and help the team to reach great heights with the thoughts and actions.
Tharun J. – The idealist of the team who keeps the team together and joins every dots and converts it all into great ideas and always on team effort.

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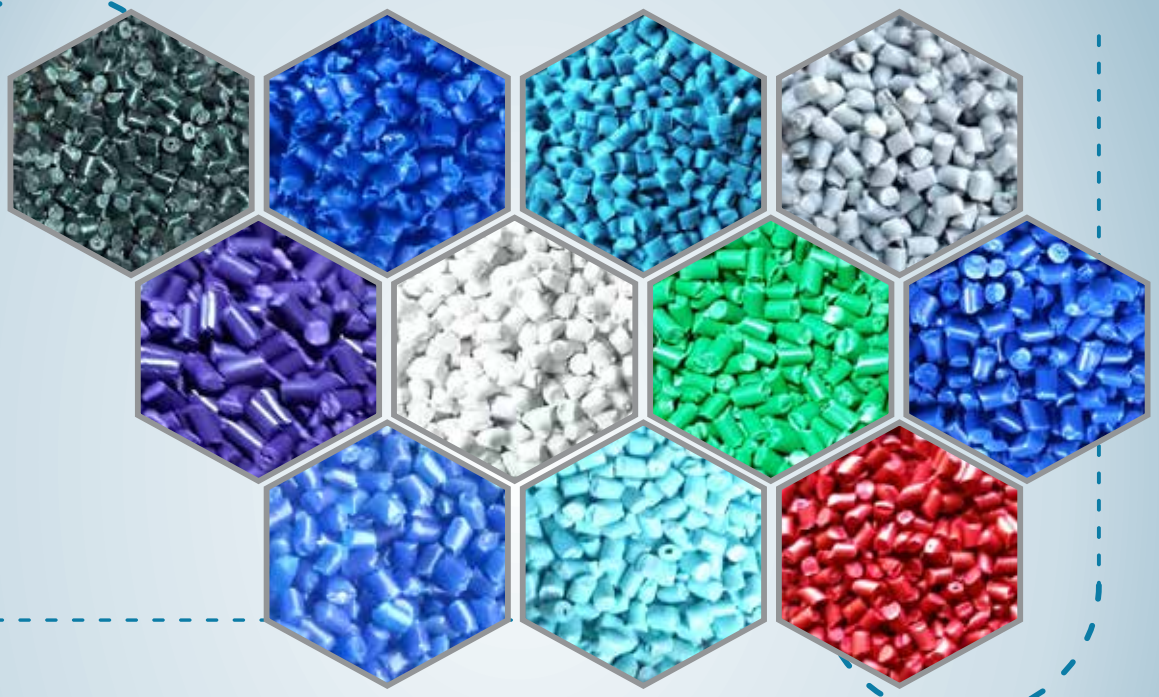

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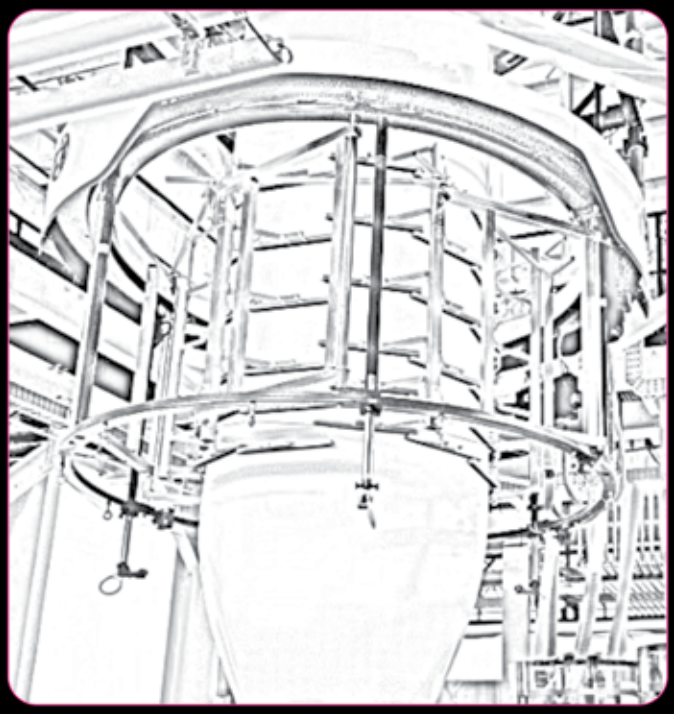

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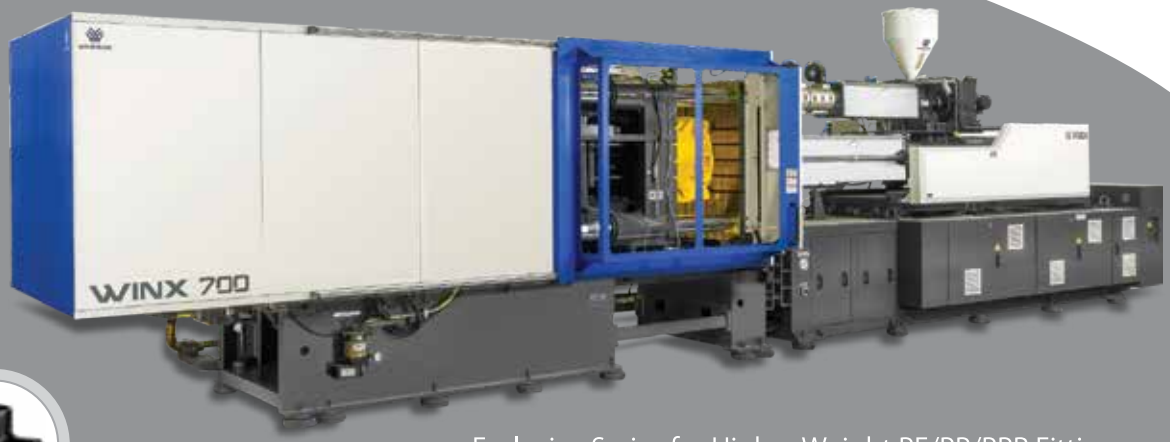

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