2023

LOVE THE OCEAN? OH THEN EXPLORE THE CONTINENT OF "GREAT GARBAGE PATCH

Take a deep breath and dive into the new continent

USED PLASTIC
IS IT A WASTE OR A RESOURCE

The race is on to decide

LOVE EATING FISH?

Microplastics are here to spoil your apetite. Turn Vegan?

FILTER PRESS

VOLUME 3

ISSUE 2

iNDEX

To be a center of excellence in chemical engineering and to provide well-prepared professionals to the industry and society

VISION

To provide a state-of-the-art environment to the students for better learning to cater to the chemical industries and pursue higher studies.

To provide space for the students in research to think, create and innovate things.

MISSION

PROGRAM EDUCATIONAL OBJECTIVES

To produce employable graduates with the knowledge and competency in Chemical Engineering complemented by the appropriate skills and attributes.

To produce creative and innovative graduates with design and soft-skills to carry out various problem solving tasks.

To enable the students to work as teams on multidisciplinary projects with effective communication skills, individual, supportive and leadership qualities with the right attitudes and ethics.

To produce graduates who possess interest in research and lifelong learning, as well as continuously striving for the forefront of technology.

Program Outcomes (POs)

1. Engineering Knowledge:

Apply the knowledge of mathematics, science, and engineering fundamentals, to solve the complex chemical engineering problems.

2. Problem analysis:

Identify, formulate, review research literature, and analyze complex chemical engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences and engineering sciences.

3. Design/development of solutions:

Design solutions for complex chemical engineering problems and design system components or process that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal and environmental considerations.

4. Conduct investigations of complex problems:

Use research based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to proceed valid conclusions.

5. Modern tool usage:

Create, select and apply appropriate techniques, resources and modern engineering and IT tools including prediction and modeling to complex chemical engineering activities with an understanding of the limitations.

6. The engineer and society:

Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional chemical engineering practice.

7.Environment and sustainability:

Understand the impact of the professional chemical engineering solutions in societal and environmental contexts, and demonstrate the knowledge of and need for sustainable development.

8. Ethics:

Apply ethical principles and commit to professional ethics and responsibilities and norms of the chemical engineering practice.

9. Individual and team work:

Function effectively as an individual and as a member or leader in diverse teams, and in multidisciplinary settings.

10. Communication:

Communicate effectively on complex chemical engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.

11. Project management and finance:

Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.

12. Life-long learning:

Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological changes in chemical engineering.

PROGRAM SPECIFIC OUTCOMES

Graduates will be equipped to apply chemical engineering principles to design equipment and a process plant.

They will be able to control and analyze chemical, physical, and biological processes, including the hazards associated with these processes.

They will be capable of developing mathematical models of real-world industrial problems and computing solutions to dynamic processes

Our Faculties

Dr Sundararaman TR
Professor & HOD

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HOD'S NOTE

I am gratified to know that our Chemical Engineering students are once again successful in bringing yet another issue to the magazine. It gives me immense pleasure to express my views on the release of the department magazine. Scanning the pages will enlighten you about the important milestones that the department has achieved this year. All the academic activity is continuously geared up and monitored to cope up with emerging trends of technological development and innovations

Dr Sundararaman TR
Professor and HOD

Chief Editor's Note

Dr L Anitha Jegadeeshwari

Saying that I'm happy to be writing to you would be a massive understatement. It always gives me immense pride to present to you, our department magazine FILTERPRESS newest issue.
This souvenir is indeed a pious attempt to make our budding talents give shape to their creativity and learn the art of being aware. Because I believe that success depends upon the power to observe, perceive, and explore. The enthusiastic write-ups of our young writers are indubitably sufficient to hold the interest and admiration of the reader.
The theme of this issue is 'PLASTICS'. In attempts to bring awareness about the hazards and effects of dumping plastics due to our current lifestyle, we present this issue to all our dear readers.
We are sure that the positive attitude, hard work, sustained efforts, and innovative ideas exhibited by our young buddies will surely stir the mind of the readers. I take the opportunity to thank all the contributors as their contribution is the reason that makes this magazine endearing to our readers. We have put in relentless efforts to bring excellence to this treasure trove. Hope this magazine proves to be an infotainer to all readers.

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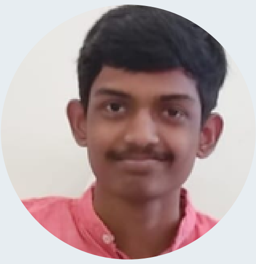
Magazine Head
Design Head



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Srinidhi

Ramya

Pragadeesh

Kabila Arasi

What you see above is not an island. It's supposed to be water. The river is contaminated with plastic waste without any means for proper disposal

The Bottom photo:
The ocean surface is filled with our litter - especially single use plastics. it's becoming a phenomenon for squba divers and oceanographers to keep finding plastic waste piles in our oceans, rahter than aquatic animals

INTRODUCTION

Plastics are a type of synthetic material made from polymers, which are large molecules composed of repeating subunits called monomers. Plastics are typically created by combining various chemicals and additives through a process called polymerization. These polymers can be molded and shaped into various forms. Polymers are versatile material that is used in many applications due to their unique properties such as durability, lightweight, flexibility, and resistance to chemicals and moisture.

A WHOLE RANGE TO CHOOSE FROM:

Plastics can be categorized into two types: thermoplastics and thermosetting plastics. Thermoplastics can be melted and reshaped multiple times, while thermosetting plastics can only be molded once and then become permanently set. Common types of plastics include polyethylene, polypropylene, polystyrene, polyvinyl chloride (PVC), and polyethylene terephthalate (PET).

The word "plastic" derives from the Greek word "plastikos," which means "capable of being shaped or molded." The word was first used in the 17th century to describe materials that could be molded into different shapes or forms when heated.

FIRST SYNTHETIC PLASTIC:

The first synthetic plastic, Bakelite, was invented in 1907 by Leo Baekeland. Bakelite was a type of thermosetting plastic that could be molded and shaped when heated and then hardened into a rigid form when cooled. It was used in a wide range of applications, including electrical insulators, jewelry, and telephone casings.

DEVELOPMENT OF PLASTIC INDUSTRY:

The plastics industry grew rapidly after World War II, as new technologies and materials were developed. Plastics became widely used in consumer goods, such as toys, household items, and appliances, as well as in industrial applications. The plastics industry is a major global industry that includes a wide range of companies involved in the production, processing, and distribution of plastics and plastic products. Some of the major players in the plastics industry include: DowChemical, BASF, ExxonMobilChemical, DuPont, SABIC, FormosaPlastics, and LyondellBasell.

The development of improved plastics has seen major technological advances and contributed to the growth of modern prosperity. Today, the term ‘plastic’ is generally used interchangeably with ‘polymer’ or ‘polymeric material’, signifying a material consisting of macromolecules. Polymeric materials are a relatively new class of materials, with their first industrial uses beginning around the turn of the twentieth century. Since then, their importance has grown at an unprecedented rate, and they now represent one of the most important classes of engineering materials. The low specific gravity of most plastic materials gives them a weight advantage over most metals. Their growth rate is high mainly because plastic materials have outstanding technical and cost advantages in a wide range of applications. Plastics are light and easy to fabricate and install; they have good electrical insulation, excellent resistance to corrosion and pests, and low maintenance costs; many can be made in a wide range of colors, or transparent.

Throughout the early 20th century, new types of plastics were developed, including PVC, nylon, and polystyrene. These materials were used in a wide range of applications, including clothing, packaging, and automotive parts as well as in industrial applications such as construction, transportation, and healthcare.

AN INVENTION TURNED VENOMOUS:

Millions of animals are killed by plastics every year, from birds to fish to other marine organisms. Nearly 700 species, including endangered ones, are known to have been affected by plastics. Nearly every

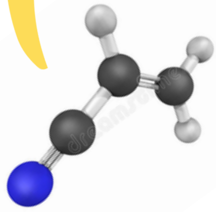
species of seabird eats plastics.

Most of the deaths to animals are caused by entanglement or starvation. Seals, whales, turtles, and other animals are strangled by abandoned fishing gear or discarded six-pack rings. Microplastics have been found in more than 100 aquatic species, including fish, shrimp, and mussels destined for our dinner plates. In many cases, these tiny bits pass through the digestive system and are expelled without consequence.

But plastics have also been found to have blocked digestive tracts or pierced organs, causing death. Stomachs so packed with plastics reduce the urge to eat, causing starvation.

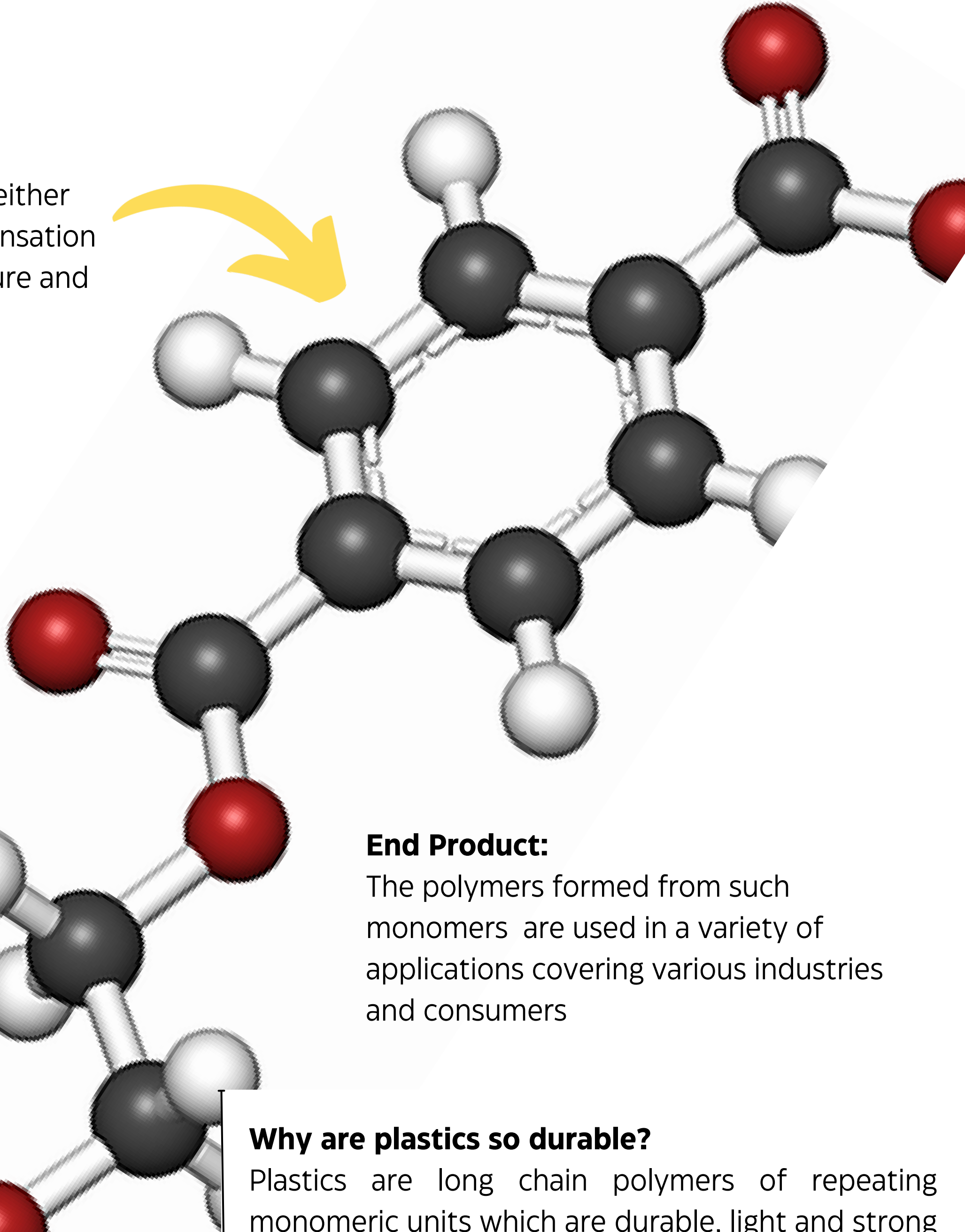
BY, Kabila Arasi B

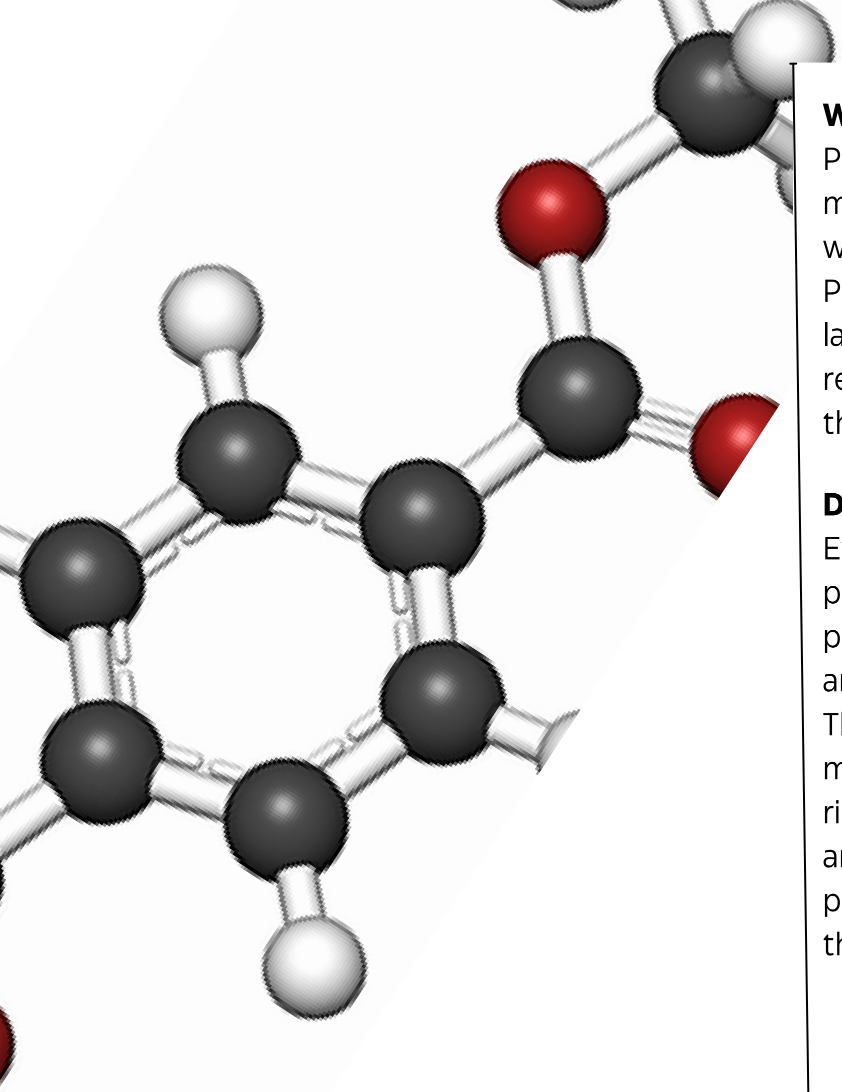
The monomers are linked by either an addition reaction or condensation reaction. Temperature, Pressure and Catalysts drive the reaction



Monomers
Monomers used to synthesis plastic are usually derived from crude oil

End Product:
The polymers formed from such monomers are used in a variety of applications covering various industries and consumers





Why are plastics so durable?
Plastics are long chain polymers of repeating monomeric units which are durable, light and strong with a multitude of applications.
Plastics are considered durable due to their long lasting resistance to extreme conditions. Their resistance to biodegradability can be attributed to the fact that they are a foreign material to nature

Did you know?
Ever wondered what's the difference between plastics and polymers? Well, its fuzzy but any polymer that is added with additives like stabilisers and plasticisers are plastics
Thus, Polyethylene is a polymer made from ethylene monomers but in its pure form, it's brittle and too rigid to be useful. To make it more flexible, additives are added. These additives modify the properties of polyethylene. It is this new modified polyethylene that we can call as a plastic.

Plastic INDUSTRIAL PROCESS

MADE TO LAST FOREVER – DESIGNED TO THROW AWAY

the same properties that make plastic a popular raw-material for a wide variety of products have also disadvantages when it comes to the environment: as a light-weighted material it can end up far from the source, durability ensures it will last long in the environment and low cost makes it more likely to be discarded.

HOW PLASTIC IS MADE?

Processes used to produce plastics on a large scale.

INJECTION PROCESS:

This process begins with the addition of plastic raw in the feed region of the injection molding machine. The resin is sent to a heated area, passing through a screw that transforms the polymeric granules into a plasticized mass.

Next, this mass is compelled by the screw to a mold, which was previously changed to have the dimensions and details of the piece that will be produced.

EXTRUSION PROCESS:

The transformation process by extrusion starts with the formulation of the plastic raw material, based on the customer's need for the manufacture of the final product. For this, the polymers are added to a mixer, remaining there for about 20 minutes.

After that, the resin is sent to the extruder and goes through the same processing as the previous alternative. After this step, the material is sent to a heated matrix, leaving it in the form of a film, like a balloon.

BLOWING PROCESS:

The transformation by blowing starts with the transport of the raw material for the plastic industry to the machine feed. After that, the material is taken to a heated cylinder, which counts on a screw conveyor, capable of modifying the chemical structure of the piece to a plasticized mass.

TRENDS IN PLASTIC INDUSTRY

The plastic industry is also one of the main contributors to industrial pollution and resource consumption. However, the situation is getting brighter since a sharp shift from linear towards circular economy became one of the main trends in the plastic industry and is expected to grow stronger in the future.

The biggest potentials for new trends in the plastic industry lie in

- mass customization,
- efficient and flexible production,
- prediction of process and product quality.

By, Pragadeesh B

Turtles, too, are put in danger by marine debris. Turtles can easily be entangled in discarded fishing nets or mistake the gelatinous texture of plastic for a jelly, their favorite food

Perhaps one of the starkest impacts on marine life is the phenomenon of "ghost fishing." Most large debris in the Great Pacific Garbage Patch is made up of inexpensive fishing nets. Ghost fishing happens when these discarded nets continue to "catch" marine life suffocating marine mammals such as this endangered Hawaiian monk seal

A young sperm whale filled with stomach full of plastic contents. This is just one of many

The Great Pacific Garbage Patch!
Twice the size of Texas City!
Rapidly Increasing!
Where are we heading towards!

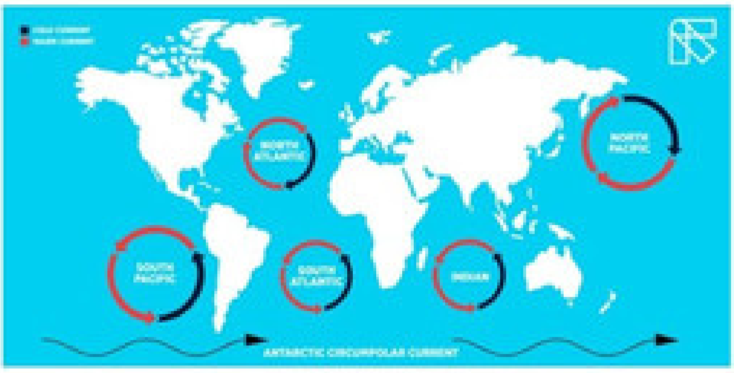
The Garbage Patch

Meet the 7th continent!

"I often struggle to find words that will communicate the vastness of the Pacific Ocean to people who have never been to sea. Yet as I gazed from the deck at the surface of what ought to have been a pristine ocean, I was confronted, as far as the eye could see, with the sight of plastic". This was what Captain Charles Moore, a sailor and oceanographer and also the discoverer of the Great Garbage Patch had to say when he was confronted with our "7th continent".

Capt. Charles Moore discovered the Pacific Garbage Patch in the year 1997 on his return from a sailing race in the Hawaii. He took a shortcut through the North Pacific Subtropical Gyre known for its calm winds and currents. It was here that, he found the ocean littered with plastic debris including plastic bottles, packaging materials and other items.

The Great garbage Patch in the pacific Ocean though is not the only region concentrated with plastic waste. There are actually five of these!



Meet the others: There are five major garbage patches (including our 7th continent), also called as gyres. These patches are located at every corner of our oceans affecting the marine life that inhabit the waters

How did those plastics end up there?

These gyres are a consequence of ocean currents which wash away these plastics into whirlpools. The plastics are then accumulated in these regions where it is relatively stable

What's so bad about dumping all our Plastics in the ocean

Microplastics

Plastics may not decay but they still could get broken into smaller pieces as a consequence of the mighty currents, sunlight and other extreme conditions. These substances are extremely dangerous

A new type of food

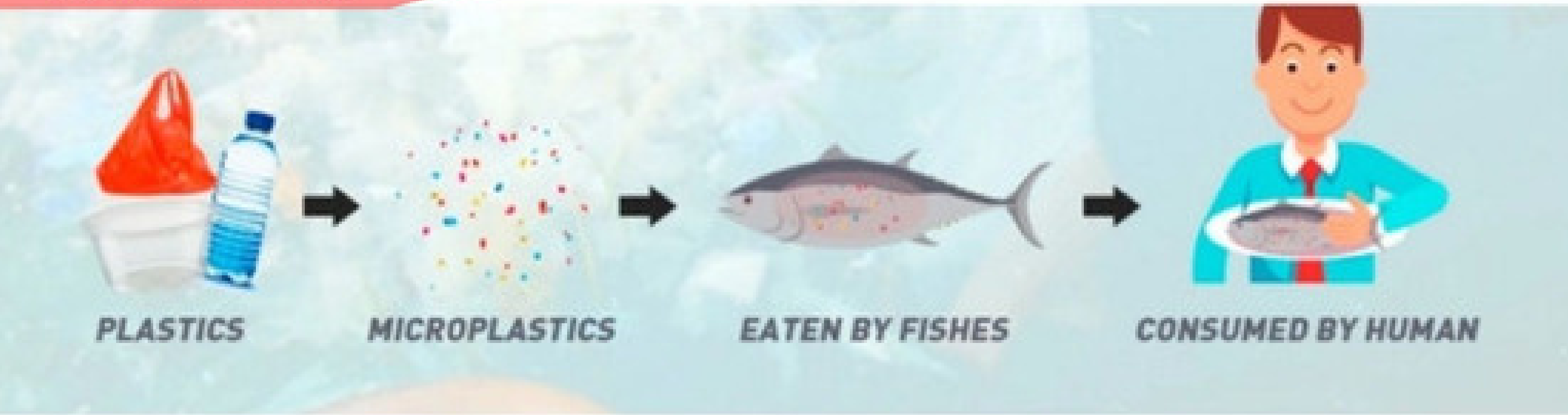
These microplastics are small enough for aquatic life to ingest them which keeps accumulating and eventually killing them.

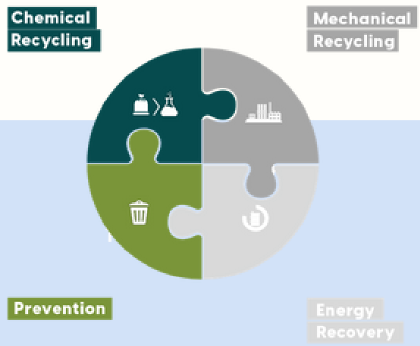
You are under threat too!

Perhaps vegetarians out there are safe. But fish lovers may need to take these microplastics seriously. One in every four fish that we found contain one or two pieces of plastic.

You may want to get used to throwing off the plastic bits and eating the fish or decide to make a change

The New Food Chain





XYCLE

THE MISSING PIECE OF THE PUZZLE FOUND

Xycle is a joint venture of NoWit, Patpert Teknow Systems and Vopak. The company has been working for 14 years on a technique for converting on a large scale non-mechanically recyclable plastic waste into secondary raw materials of virgin quality through chemical recycling.

HOW DOES IT WORK?

As we all know, plastic waste is a huge global problem for the environment. Unfortunately, less than a quarter of all plastic waste is currently being recycled. This means that the rest of our plastic waste ends up in landfill, being incinerated or dumped as waste in the environment. If we continue to produce new plastic, not only will our use of natural resources increase, but also our CO2 emissions and the heap of plastic waste will just keep growing enormously.

THE RESEARCH AND DEVELOPMENT

After the process, the developers of Xycle are about to build a plant in the Netherlands that will sustainably convert 20 K tonnes of non-recyclable plastic into high-quality feedstocks every year.

The tried and tested process of Xycle has come up with a solution where it emits less CO2 than is emitted when incinerating mixed plastic waste which provides the chemical industry with a responsible alternative for producing new plastics. This includes heating mixed plastic without adding oxygen. It does not burn, but disintegrates and can be used again as a raw material.

Xycle expects to receive the environmental and building permits in the third quarter. This means construction of the plant can start in mid-2023, and is expected to be operational at the end of 2024.

CIRCULAR SOLUTION

Xycle has developed a technology to process plastic, which is difficult to mechanically recycle, in a sustainable way. For example, the (petro)chemical industry needs fewer fossil raw materials for the production of new plastics. The Xycle plant is self-supporting and runs on the fuel produced by the machine itself. Recycling plastic in this way not only requires fewer new raw materials, but CO2 emissions are also significantly lower than when mixed plastic waste is incinerated, as is now often the case.

GLOBAL ROLL OUT

In addition to this plant, which converts 20,000 tons of plastic into approximately 20 million litres of liquid hydrocarbons (pyrolysis oil), they also want to operate plants with a capacity of 80 to 100,000 tons per year using its depolymerization technology which must be rolled out worldwide.

- Ramya R

HISTORY OF
PLASTICS

·1839

Charles Goodyear discovers vulcanization, which improves the durability of rubber.

·1856

·Alexander Parkes creates Parkesine, the first plastic, by heating cellulose with nitric acid and camphor.

·1926

Polyvinyl chloride (PVC) is invented by Waldo Semon.

·1933

Polyethylene is discovered by accident by Eric Fawcett and Reginald Gibson at Imperial Chemical Industries (ICI).

·2018

China bans the import of plastic waste, leading to increased scrutiny and action on plastic waste management globally.

Plant-Based Plastics: A Sustainable Alternative to Crude-Based Plastics

Plastics have become an integral part of modern life, with a wide range of applications in packaging, consumer goods, and industrial products. However, the environmental impact of plastics, especially those made from crude oil, has become a growing concern. Plastic waste litters our oceans, harms wildlife, and releases harmful greenhouse gases when incinerated. As a result, there has been increasing interest in plant-based plastics, which offer a more sustainable alternative to traditional plastics.

Plant-based plastics, also known as bioplastics, are made from renewable resources such as cornstarch, sugarcane, and potato starch, among others. Unlike crude-based plastics, which are made from fossil fuels, plant-based plastics are derived from plants that can be grown and harvested repeatedly, making them a more sustainable option.

One of the most significant advantages of plant-based plastics is their biodegradability. This helps reduce landfills and land pollution.
Another advantage of plant-based plastics is their reduced carbon footprint. Thus reducing the greenhouse effect. In addition to this, the production of bioplastics requires lesser energy.

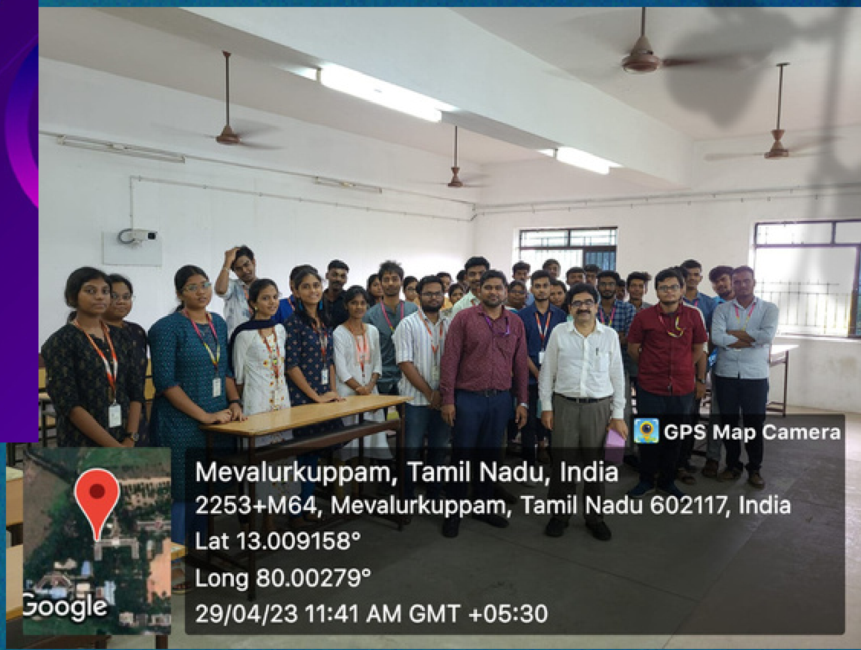
Just like two sides of a coin, bioplastics have their own disadvantages too. They are more expensive than traditional plastics and do not have the exact physical properties of crude plastic, thus making them inappropriate for a few applications.
However ongoing research and development in technology will take bioplastics to greater heights in the future.
Researchers at the University of Bath in the UK have developed a new process for making bioplastics from sewage sludge. The process involves extracting a biopolymer from the sludge, which can be used to produce bioplastics. This has the potential to turn waste into a valuable resource and reduce the amount of plastic waste generated.

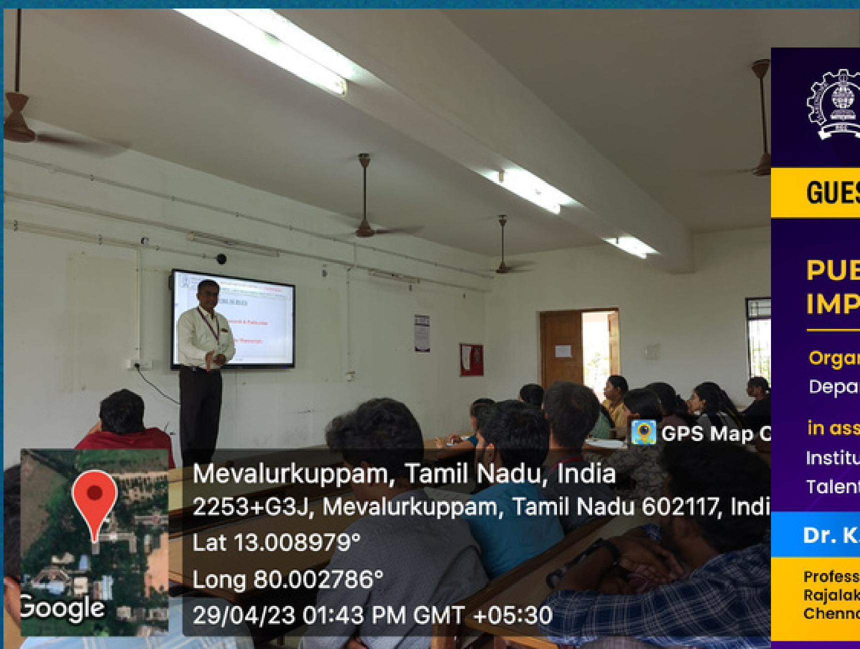
Another area of research is the development of biodegradable alternatives to traditional plastics. Companies such as TIPA and Tipa-Corp are developing biodegradable alternatives to traditional plastics that can be composted in the home or industrial composting facilities.

In conclusion, plant-based plastics offer a sustainable alternative to crude-based plastics, with the potential to reduce plastic waste and greenhouse gas emissions. While there are still challenges to overcome, ongoing research is addressing these challenges and developing new plant-based plastics with improved performance characteristics. As technology improves and economies of scale are achieved, it is likely that plant-based plastics will become a more viable alternative to traditional plastics in the future.

• Srinidhi V

TEC Chem Events





Chem Events

Chem Skill Development Certification Distribution

ChemSkill Development, a five-week program conducted at Rajalakshmi Engineering College, successfully bridged the gap between academia and industry for chemical engineering students. The program aimed to equip students with practical skills, industry knowledge, and invaluable connections. Through a series of workshops, interactive sessions, and interactions with industry experts, students gained hands-on experience and a deeper understanding of real-world applications in the chemical engineering field.

Additionally, site visits to chemical plants and manufacturing facilities provided firsthand exposure to safety protocols, cutting-edge technologies, and environmental considerations. Overall, ChemSkill Development empowered students by enhancing their industry awareness, developing practical skills, and guiding their career pathways. By bridging the gap between academia and industry, the program played a vital role in preparing aspiring chemical engineers for the challenges and opportunities of the professional world.

Chem Events

Nippon Paint is based in Japan and has over 140 years of experience in the paint industry. It is the number one paint manufacturer in Asia, and among the leading paint manufacturers of the world.

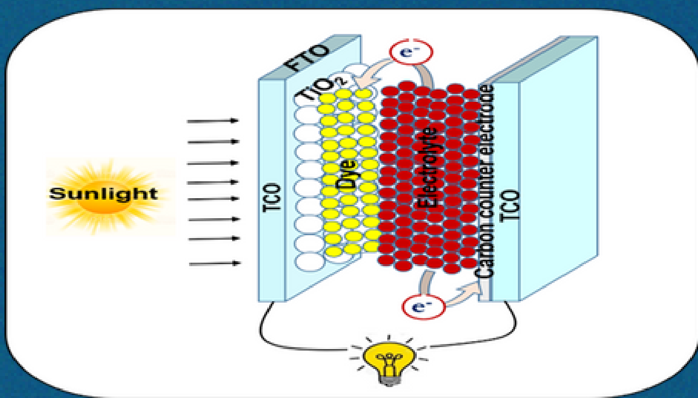
The department of Chemical Engineering from Rajalakshmi Engineering College, Thandalam took up a project on Optimization of Mass Fluctuations at Nippon Paint India Pvt Ltd Factory, Sriperumbudur. We initiated the project by recording the mass of different sized paint containers and analyzing the reason behind it. We visited the water-based and solvent-based sectors of the industry and got an insight about how paint is manufactured. Several runs of readings were tabulated and graphs were plotted against the target value to understand the digression better. Three students from our department had the privilege to carry the experiment and manifold insights were given to the industry to improve the operational efficiency. Another project mainly focusing on the Effluent treatment plant, located in the paint shop floor, was taken on. Experimentation on Optimization of Coagulant Dosage was carried out for the minimum sludge condition, thereby the cost of coagulants and additives can be reduced and also sludge handling complications can also be avoided. The core team of Nippon Paints appreciated the involvement of students. Scale up studies and analysis of experimental results are going on with the support of the Nippon Paints Operations team. Overall it was a wealth of experience to the department.

Nippon Paints Project

Dye Sensitised Solar Cells for Energy Harvesting

Dr. K.L. Vincent Joseph , Professor, Department of Chemical Engineering had successfully undertaken his defence related research work at Bharathiar University campus, Coimbatore. Energy harvesting from solar radiation is an emerging technology in the framework of non-conventional energy technologies. In this concern, dye sensitized solar cells popularly known as Grätzel cells based on semiconductor materials exhibit high absorption in the visible wavelength region of the solar energy spectrum. The major role of a sensitizer is to absorb the incident photons and to inject these photo-excited electrons into the semiconductor. An ideal sensitizer has to be grafted securely to the surface of the semiconductor to release the electrons effectively into the conduction band, ability to absorb light below a near-IR wavelength of 920 nm, stable enough to ensure 108 turnovers pertaining to 20 years of exposure to sun without undergoing any degradation, its redox potential has to be high enough such that it can be regenerated rapidly through donation of electron from the electrolyte.

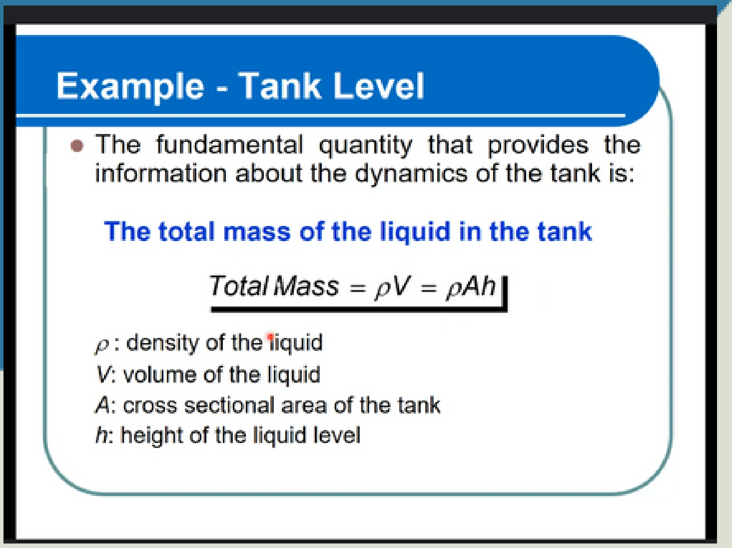
Novel sensitizer materials with differing anchoring groups for extended light absorption were synthesized, characterized for their possible application in power generation. DSSC's are the future of solar that possess numerous advantages compared to the older types of PV cells which could be used in low density applications, portable gadgets and for indoor applications.

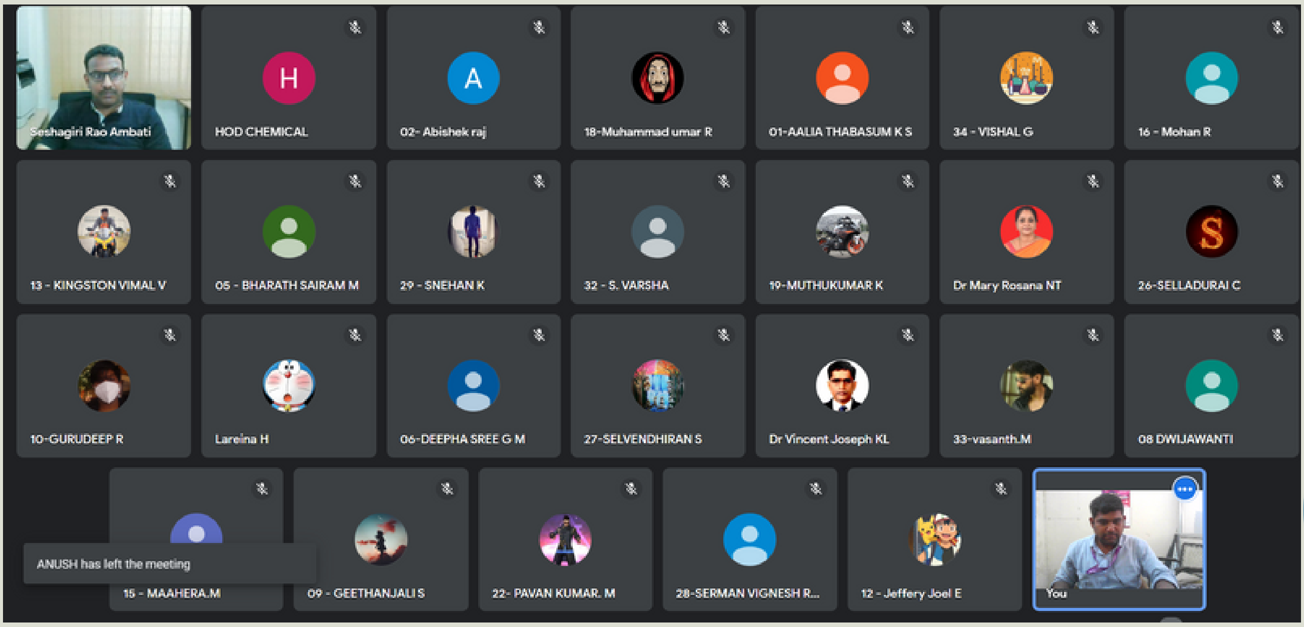


Dr K.L. Vincent Joseph during his research work

GUEST LECTURE

WEBINAR





Placement Details

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LPA: 6
CGPA: 8.15

Ananya V
Placed at Emerson Electric
LPA: 4.5-5
CGPA: 9.18

Karthik Sreevatsan D
Placed at Emerson Process Management
LPA: 4.5
CGPA: 8.73

Kiran S
Placed at TPI composites
LPA: 4.5
CGPA: 8.01

Placement Details

Lavanya D
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CGPA: 8.79

Yuvaraj S
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CGPA: 8.36

Hemalatha M R
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CGPA: 8.29

Ajay S
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CGPA: 8.14

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CGPA: 8.66

Aravindhan V
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CGPA: 8.6

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CGPA: 8.88

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CGPA: 8.63

ACKNOWLEDGEMENT

BY MAGAZINE HEAD

I hope our magazine induces ideas for the betterment of humanity and lights the spark in the hearts of our dear readers. I thank the Head of the Department, the Chief Editor, and the team for their time and efforts put into making yet another issue possible.

We believe there's always space for improvement no matter how particular we are about things. We are open to suggestions and feedback which will help us shape the magazine.

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Filterpress