EFFECTS OF USING POLYETHELENETEREPHTHALATE IN FOOD PACKAGING INDUSTRIES ON HABITAT AND ITS POSSIBLE ALTERNATIVES: A REVIEW

Capstone Project-I Report submitted in

Partial fulfillment for the award of the

Degree of

BACHELOR OF TECHNOLOGY

Submitted by

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IN

MECHANICAL ENGINEERING

DEPARTMENT OF MECHANICAL ENGINEERING

Under the Supervision of

MR. KAPIL RAJPUR

(Established under Galgotias University Uttar Pradesh Act No. 14 of 2011)

MAY- 2022

DEPARTMENT OF MECHANICAL ENGINEERING

BONAFIDE CERTIFICATE

Certified that this project report **"EFFECTS OF USING POLYETHELENE TEREPHTHALATE IN FOOD PACKAGING INDUSTRIES ON HABITAT AND ITS POSSIBLE ALTERNATIVES: A REVIEW"** is the bonafide work of "**MOHAMMAD USMAAN ALI HASHMI (19021012109), RAHUL PATWAL (19021012108),** who carried out the project work under my supervision.

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This thesis/dissertation/project report entitled titled **EFFECTS OF USING POLYETHELENE TEREPHTHALATE IN FOOD PACKAGING INDUSTRIES ON HABITAT AND ITS POSSIBLE ALTERNATIVES: A REVIEW** by- **MOHAMMAD USMAAN ALI HASHMI-19021012109, RAHUL PATWAL-19021012108** is approved for the degree of bachelor of technology in mechanical engineering.

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1. Project report title:**“** EFFECTS OF USING POLYETHELENE TEREPHTHALATE IN FOOD PACKAGING INDUSTRIES ON HABITAT AND ITS POSSIBLE ALTERNATIVES: A REVIEW”**.**
2. Degree for which the report is submitted: BACHELOR DEGREE OF TECHNOLOGY.
3. Project Supervisor was referred to for preparing the report.
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8. The report has not been submitted elsewhere for a degree.

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ABSTRACT

Polyethylene Terephthalate has been a tremendous source of material in food packaging industries for decades. The reason behind this are its mechanical and chemical properties which makes it a favorable choice. Polyethylene Terephthalate can be recyclable but it is non-decomposable which makes it harmful for the environment. Polyethylene Terephthalate can cause serious health issues in human body which includes Asthma, Pulmonary cancer, and Liver damage. Around 14 million metric tons of Polyethylene Terephthalate is dumped in the ocean every year which has become a major reason for the killing of marine habitat. In this paper, we studied production of Polyethylene Terephthalate, its decomposability, recyclability, and its effects on the habitat. We also studied the possible alternatives that can replace Polyethylene Terephthalate in the future. consists of 70 percent terephthalic acid and 30 percent monoethylene glycol (MEG) by weight and is frequently used in the packaging sector. Bio-MEG is made using ethanol from sugar cane. According to a study by the IFEU Institute commissioned by the Federal Ministry of Food and Agriculture, it is approximately 20–40% more expensive than conventional PET. The ethanol produced from Brazilian sugar cane forms the starting point for the production of monoethylene glycol (MEG). Bio-PET can be introduced into the existing recycling system as a drop-in solution. The long-term goal is to produce a completely bio-based PET bottle, for which the terephthalic acid is also obtained from renewable raw materials. PET is a material with high breaking strength and medium barrier properties. PET is not resistant to strong inorganic acids.

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CHAPTER 1

INTRODUCTION

Polyethylene Terephthalate also known PET or PETE is the most widely used material for the packaging of water and soft drinks. The Reason behind this much use of PET is its Chemical and Physical Properties which makes it preferable over other polymers available in the market. Its properties include low breakability rate, light weight and its impediment properties to liquids. Use of Recycled PET in the food packaging industries is not legalized because there's a risk of contaminated substance to get into the packaged food which might not suit human body and may cause serious health issues. The recycled PET is used as a filling in mattresses, jackets and it is also used in the production of non-food items.

The utilization of PET in soda pop businesses is expanding on an exceptionally high rate yearly. As indicated by investigation of Gathering of CSIR-NCL over 60% of the 900 kilotons huge loads of PET made in India yearly is reused. Greater part of the rest 40% PET winds up in landfills and a little portion in sea.

PET is non decomposable material; it takes more than 900 years to decompose a plastic bottle. The PET waste dumped in landfills leaves a harmful effect on the environment, it destroys the quality of the soil and also affects the health of the animals. Researches have shown that the dumped PET is a major cause for many human diseases which includes cervical cancer and Ovary Syndrome.

1.1 THE MATERIAL THAT CHANGED THE FOOD PACKAGING INDUSTRY- POLYETHELENE TEREPHTALATE

Founded in 1953, Polyethylene Terephthalate bought a revolution in food packaging industry,especially in beverages sector. The reason for the widespread use of Polyethylene Terephthalate is the Food perseverance quality of the material. The properties of Polyethylene Terephthalate includes goods abrasion, good chemical resistance, dimensional stability and light weight. The Polymers of Polyethylene Terephthalate are formed by ethylene glycol and terephthalic acid. The resulting resins is then extracted and cut into pellets. The pellets are then heated and converted into desired shapes.

PET is quickly becoming the world's favourite food and beverage packaging material because to its unique features. It is an extremely strong and inert material, similar to glass, that does not react with foods, is resistant to microorganism attack, and will not biologicallydecompose.
However, unlike glass, PET is exceedingly lightweight, transportable, and shatterproof.

1.2 PRODUCTION OF POLYETHELEN TEREPHTALATE

The natural substances to make PET are monoethylene glycol (MEG) and decontaminated terephthalic corrosive (PTA) or dimethyl terephthalate (DMT). PTA is the favored feedstock for process financial reasons in spite of the fact that DMT might be leaned toward in polyester film applications due its bond expansion quality. The primary cycle steps are unrefined substance arrangement, esterification/transesterification, pre-polycondensation and polycondensation.

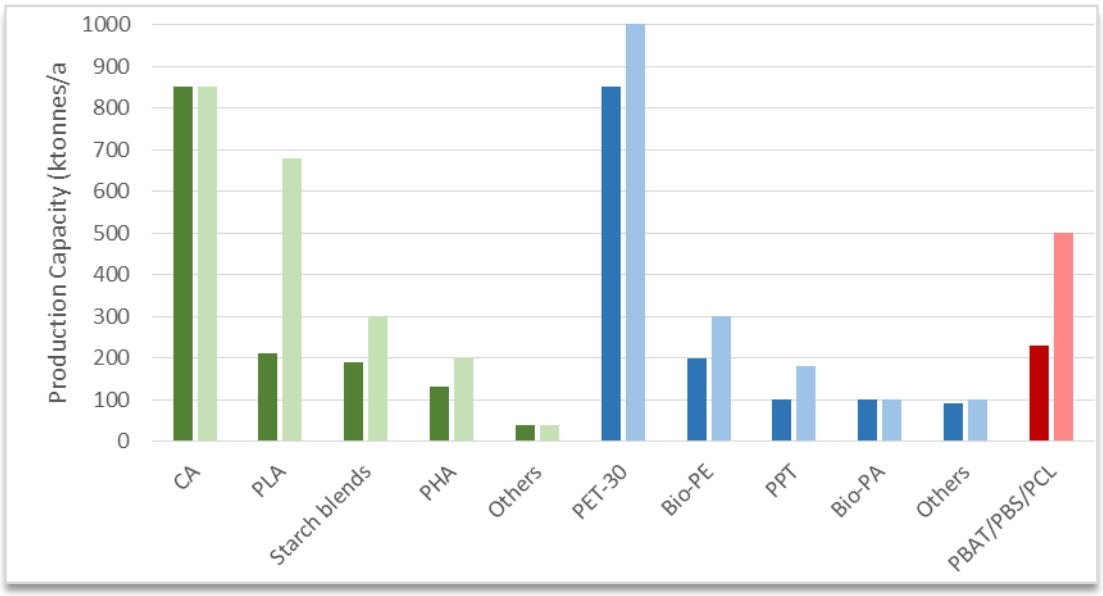

Figure 1- Production Capacity

The PTA is blended in with the MEG and impetus arrangement in a glue and took care of into the esterification framework. The esterification happens under climatic tension by separating the water.

At the point when DMT is utilized, the DMT dissolve and impetus are siphoned with MEG into the transesterification framework, where the response happens under barometrical strain by separating the methanol. The materials split off are amended and recuperated.

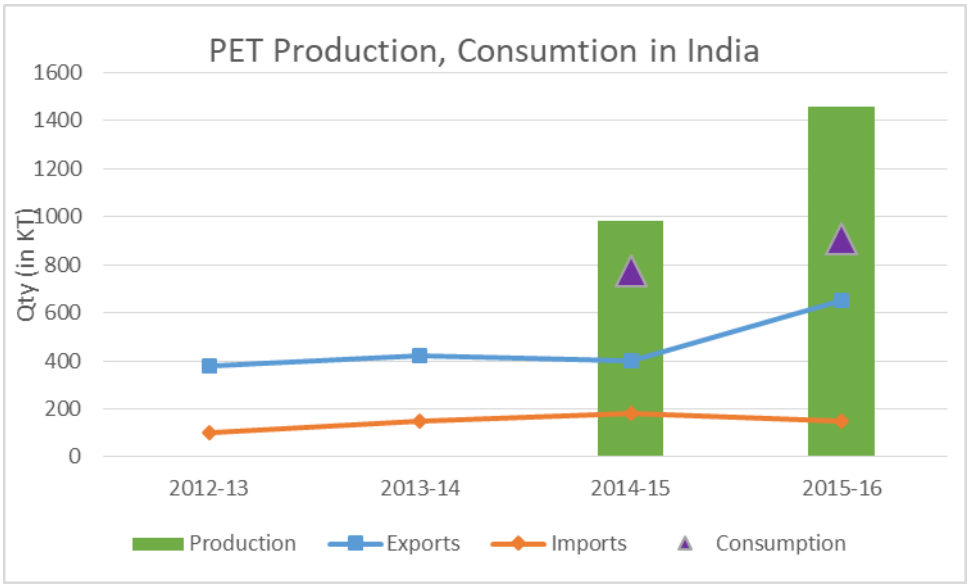

Figure 2- PET Production, consumption in India

The item from the esterification/transesterification step is then shipped off the pre-polycondensation unit where the response happens under a vacuum. The pre-polycondensation item is taken care of to the last polycondensation reactor which works

under expanded temperature and vacuum. The polyester liquefy is handled either into strands/fibres or shipped off the strong state polycondensation (SSP) unit to make bottle grade chips.

WHY POLYETHELENE TEREPHALATE IS USED SO EXTENSIVELY?

Polyethylene terephthalate (PETE or PET) is the most generally utilized thermoplastic polymer on the planet and is better known in the material business by the trademark "polyester." It is a normally straightforward and semi-translucent plastic broadly utilized as a fibre for attire, as a compelling dampness obstruction with wide materials in packaging and bundling (referred to in these cases as PET or "PET gum"), and as a designing plastic when it is joined with different materials like glass.

Properties	LLDPE*	LDPE*	HDPE*	HDPE-pc
Density (g/cm^3)	0.910 - 0.925	0.915 - 0.935	0.941 - 0.967	-
Melting (0C)	121 - 125	106 - 112	130 - 133	130
Stress (MPa)	14 - 21	7 - 17	18	20
Elongation (%)	200 - 1200	100 - 700	20 - 100	12
Impact resistance (J/m)	-	0.67 - 21	27 - 160	42
Elastic modulus (MPa)	100 - 200	102 - 240	960 - 1000	453

Table 1- Properties of PET

fibre or carbon nanotubes to fundamentally expand the material's solidarity. It is a normally dull, semi-glasslike material. A portion of its most significant attributes incorporate its protection from water, its high solidarity to weight proportion, the way that it is essentially shatterproof (it will not break like glass bundling), and its wide accessibility as a monetary and recyclable plastic.

PET was first polymerized during the 1940s by DuPont scientists hoping to foster polymer materials for use as material filaments. It is delivered from the blend of ethylene glycol and Terephthalic corrosive. Indeed, even without added substances to build its solidarity, PET is still extremely impressive for its light weight. This implies that less

material is needed for utilizations like plastic film for bundling. This implies less fuel is needed for transportation when utilizing PET bundling.

Furthermore, albeit the material is oil based, roughly 40% of the energy is put away inside and is accessible a subsequent time once reused. As per PETresin.org, "life cycle investigations of PET have reliably demonstrated it to be an exceptionally manageable material with a positive.

CHAPTER 2

LITERATURE REVIEW

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PET is extremely recyclable plastic sap. It is a polymer made by the mix of monomers: altered ethylene glycol and refined terephthalic corrosive. Initially, it was blended in United States of America during the mid-1940s. 0 50 100 150 200 250 300 Asia Pacific North America Western Europe Latin America Eastern Europe Middle East/Africa Australasia Billion Units 2020 2016 2011 Titled with the 1st code on or close to the lower

part of jugs including compartments, Polyethylene Terephthalate is every now and again used for the packaging of daily use items including drinks, peanut butter, pastry kitchen products,
produce, frozen food sources, salad dressings, and beauty care products,. Known for its solidarity, thermo-soundness, and toughness, Polyethylene Terephthalate is a reliable decision for packaging. PET is also modest, lightweight, reusable, unbreakable, and recyclable. Recyclable polyethylene terephthalate (RPET) is the most generally reused plastic in the World. As shown by PETRA, the Polyethylene Terephthalate Sap Affiliation, the United States rate of recycling is around 34% in 2013, while it is 54% in the European Association. In 2017, the United States recycling rate had fallen beneath 31%. Practically 1.7 billion pounds of PET were recycled in 2016, used for making mixture of final reports. An Organization of United States-EPA reveals that 2% of major waste of urban cities in the United States is ascribed to Polyethylene Terephthalate compartments.

Organizations are progressively perceiving the Importance of Reusing PET in Food Grade Items like soft-drink compartments. Coca-Cola plans to put half of its recycled Polyethylene Terephthalate in containers by 2030. While food grade handling has been established, efforts are being made to address the productivity of handling advances. The accessibility of PET materials for postal customers is a test. The recovery rate in the United States has remained the same or has declined recently the current situation is exacerbated by the low aging of materials from roadside reuse programs, which is equated with the decline in soda's fame, as is the pattern for lightweight jug plans. One way to further develop PET recovery is to use shelf scaffolding. The Public Relationship for PET Compartment Assets (NAPCOR) and the PET Gum Affiliation (PETRA) can give extra data on PET reusing. PET containers, post use, actually convey a ton of significant worth, and reused PET (r-PET) can be utilized in a wide assortment of uses. This makes post-buyer PET jugs an extremely pursued thing by squander gatherers. Disposed of PET jugs bring waste authorities Rs. - 14-15/kg. These jugs are purchased by scrappers or squander merchants, who utilize individuals to isolate, sort and further offer it to enormous sellers or recyclers. The covers, neck rings, names (non-PET parts) are taken out, and the containers are destroyed, washed, and sold as what is called 'washed chips'. The pieces are then used to make the (transcendently) fibres, which is utilized as a filler for pads, cushions, and changed over to textures for use in apparel, upholstery, and so forth These finished results sell at anyplace between Rs. - 50-110/kg; the market for r-PET items is very enormous. There are 40+ huge makers across India who use r-PET as natural substance. The PET reusing business can be assessed (generally) to associate with Rs. - 3,000-4,000 crore in a given year in India.

CHAPTER 3

RECYCLEABILITY OF PET

PET is extremely recyclable plastic sap. It is a polymer made by the mix of monomers: altered ethylene glycol and refined terephthalic corrosive. Initially, it was blended in United States of America during the mid-1940s.

Titled with the 1st code on or close to the lower part of jugs including compartments, Polyethylene Terephthalate is every now and again used for the packaging of daily use items including drinks, peanut butter, pastry kitchen products, produce, frozen food sources, salad dressings, and beauty care products,. Known for its solidarity, thermo-soundness, and toughness, Polyethylene Terephthalate is a reliable decision for packaging. PET is also modest, lightweight, reusable, unbreakable, and recyclable.

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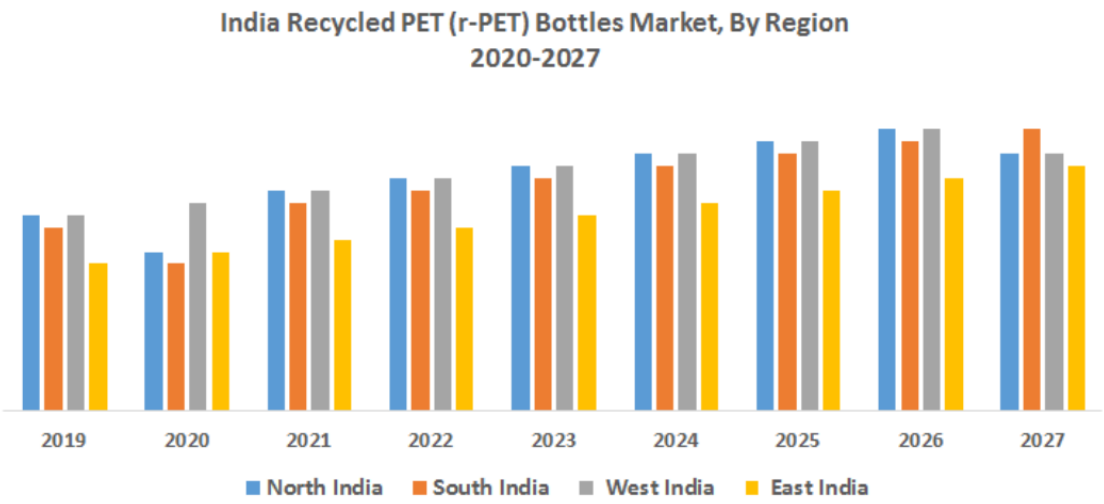
After-purchaser Polyethylene Terephthalate substance is collected through curb side recycling systems, as well as both single-flow and double-flow extract close. Furthermore, other Polyethylene Terephthalate recycling systems are deliberated to redirect void Polyethylene Terephthalate jugs at zones of deep gathering, e.g., on the loose occasions.

Reusable substances, for example, Polyethylene Terephthalate might be presented from other reusable at substances recovering groups, it was then packed for shipment to the PET recycling office. Likewise it is need to spotlight other materials legitimate packages care and capacity practices to limit item contamination.



After the arranging system, the PET material is ground into particles known as "chips." Drop virtue is vital to saving the worth of the recovered plastic. Further partition procedures include washing and air characterization just as water showers, where material either sinks or floats, which helps separate leftover unfamiliar materials. Washing can be attempted at standard or raised hotness levels. The utilization of sanitizers and cleansers supports accomplishing a total cleaning.

After the finish of crushing, washing and partition, the material is flushed to wipe out any excess impurities or cleaning specialists. The reused PET is then dried before renewed introduction as an assembling material or before additional handling.

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CHAPTER 4

DECOMPOSIBILITY OF PET

As indicated by a review distributed in the diary Science, up to 12.7 million metric huge loads of plastic end up in our seas consistently and can increment by ten times over the course of the following 10 years assuming we don't act now. How about we investigate what happens when plastic winds up in the climate.

Polyethylene is the most regularly utilized plastic on the planet. High-thickness polyethylene (HDPE) is utilized in items and bundling like plastic packs, refillable containers, and milk containers. Low-thickness polyethylene (LDPE) is utilized to make items like cling wrap, bundling for PC equipment, and toys.

By having monomers of ethylene interface together to shape solid bonds to make polyethylene, you have material that is incredibly tough. It takes a massive measure of energy to be made, so it doesn't normally happen. The disadvantage to this is that it turns out to be considerably harder to separate naturally. Thusly, polyethylene photodegrades and it might require hundreds of years for the sun to have the option to separate the plastic sacks.

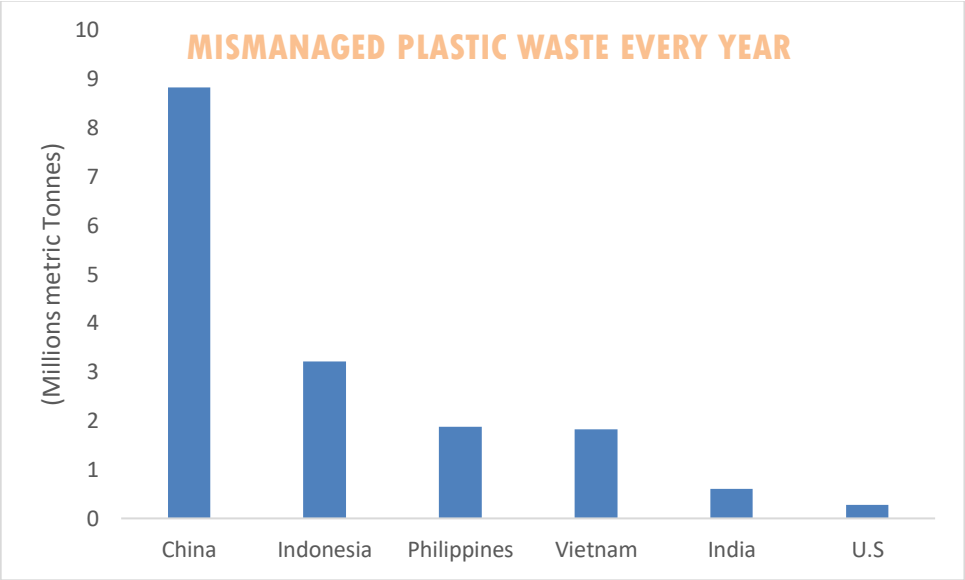
What's considerably more risky is that it's not only one plastic sack. All things considered, each of our little activities of discarding plastic packs have gathered results to frame a mass known as the Incomparable Pacific Trash Fix, otherwise called the Plastic Vortex. Remain in order for the following blog entry to find more with regards to it.

DUMPING OF PET AND ITS EFFECTS

Although plastics have many important uses, we have become dependent on disposable or disposable plastics with serious natural consequences.

All throughout the planet, 1,000,000 PET water bottles are bought each moment, while 5000 billion single-utilize PET packs are utilized in the whole world consistently. Altogether, a big part of PET delivered is usable just once and afterward discarded.

Dumped PET is presently omnipresent at Normal habitat proposed by researchers as geographical mark at catastrophism time. Analysts estimate that about 9 billion tons of plastic have been produced since the mid-1950s. About 59% of this PET is disposed of in landfills or local habitats.



From late 1940s, the pace of PET creation has become quicker than that of some other substances. There has also been a shift from the development of strong plastics to plastics that need to be discarded after being used alone.

Almost over 100% plastic are created from synthetics got from oil, flammable gas and coal which are all grimy, non-inexhaustible assets. In case latest things proceed, by 2051 the plastic business could represent 21% of the worlds all out oil utilization.

This single use plastic items are all over. For large numbers of us, they have become basic to our regular routines.

We want to slow down the progression of plastic at its source, however, we need to develop the way we deal with our plastic waste in the same way. Since the present moment, a great deal of it winds up in the climate.

Only 8% of the plastic waste generated at a given point in time is reused. About 14% was incinerated and the remaining 78% was recovered in landfills, landfills, or homes.

According to new research, tobacco buds with small plastic threads in ducts were the most well-known type of plastic waste found in climates around the world. The most common were beverage bottles, bottle lids, food envelopes, staple bags, beverage attachments, straws and stirrers. Many of us use these articles consistently, without thinking about where they end up.

Rivers carry plastic waste from deep inland into the ocean, making them a major contributor to ocean pollution.

An astonishing 9 million tonnes of plastic will reach the Earth's oceans forever. Large amounts of plastic come from waterways that meet the oceanic climate as direct trash cans from urban areas of the world.

PET waste regardless of whether in a waterway, a sea, or ashore can endure in the climate for a really long time.

CHAPTER 5

POSSIBLE MATERIAL THAT CAN REPLACE PET IN SOFTDRINK INDUSTRIES

Standard plastic materials are at present created utilizing monomers extracted from petroleum, which is a non-inexhaustible asset and consequently ill-fated to run out inside various many years. Then again, the utilization of plastic jugs and other expendable things is modest, advantageous and pragmatic for the client.

The equal the initial investment point, at which these requirements can be adjusted is presumably the improvement of new cycles and polymers ready to supplant the current oil-based PET creation. Generally, the beginning monomers are gotten by refinery liquid. The material framed in this manner is the thing that is normally called standard PET.

1.1. PLA and PHA

The conversation about this choice to PET can open an entire world for sure. All throughout the planet, there's an unbelievable measure of action identified with the advancement of biodegradable polymers for a wide range of utilizations customarily connected with PET.

In the sector of food packaging, a blossom of preliminaries and public statements on this subject is seen. Hence, we will center the conversation just in the arrangements as of now or practically accessible available in the packaging area. The well-known ecological polymer at present utilized in beverages packaging is Poly-lactic Corrosive (PLA), a thermoplastic polyester got from sustainable assets, for example, starch, custard or sweet stick. Since PLA is as of now utilized for some applications (inflexible holders, packs, containers, films there are numerous accessible providers all over the globe.

Additionally, in regards to bottles, a few items are now available. To specify a couple, the 'Bio Jug' From Italian water brand Sant` Anna available throughout the previous 10 years, while the 'Vegan-bottle' was as of late dispatched by the French organization Lys-Packaging.

It might give the idea that PLA could be the answer for every one of the ecological difficulties identified with plastic business sectors however that is false. Truth be told, PLA is ecological just in explicit temperature and mugginess conditions (around 55-70 days at 45-55 °C and high moistness). That is, you cannot throw a jug into the sea or leave it in the forest to break it. In indigenous habitats, it takes years to fully biodegrade.

The second scary news is that if PLA is incorporated into a regular plastic collection stream, it can severely contaminate the PET reuse system. Arrangement is a glossy new harvest or arrangement process entirely exclusive to PLA, with all administrative and labor costs. Tragically, the PLA market is not yet large enough to justify such a company.

In contrast to the PLA currently on the market, the most attractive option is polyhydroxyalkanoates (PHA). This abbreviation implies a group of normal biodegradable polymers that can be degraded not only in soil, but also in soil, freshwater and seawater. PHA is manufactured using a whole new innovation as it gradually occurs as a result of the absorption of cellulosic substances by some selected microorganisms. Containers and containers made with PHA look very murky and the mechanical properties will be presumably rather poor.

Regardless, this material remaining parts flawless as long as it isn't disposed of, notwithstanding, all things considered, will then, at that point, break down inside 2 months in soil or water. One of the biggest PHA makers is the USA-based organization Danimer Logical, who as of late marked a worldwide association with Nestlè to create biodegradable PHA bottles.

1.2. PEF and PTF

PET has a great deal of exceptionally valuable properties: it is light, straightforward, modest and effectively recyclable. In any case, it additionally languishes a few disservices over the food bundling industry, fundamentally helpless boundary properties to gas pervasion. Practically speaking, this implies a more limited time span of usability for the eatable item because of the entrance of oxygen and the deficiency of carbon dioxide through the holder's divide.

Oxygen infiltration speeds up the oxidative responses of different staples like lager, milk, juices and practically all strong food varieties. A deficiency of carbon dioxide can affect the nature of carbonated sodas, an enormous market area for the PET business.

Thus, some substance organizations have been searching for an option in contrast to standard PET which, as well as being all the more harmless to the ecosystem, can likewise guarantee better execution specifically for gas hindrance properties.

At present, there are two of such polymers being developed: polyethylene furanoate (PEF) and polytrimethylene furandicarboxylate (PTF). Past the precarious compound names, the fact of the matter is that they are both furan polymers possibly feasible from 100 % inexhaustible sources.

PEF is a macromolecule like PET in which the terephthalic corrosive is supplanted by another monomer named FDCA, a sugar determined particle. PEF can further develop bundling maintainability since this polymer is 100 % bio-based when BIO-MEG is utilized in the response. Additionally, FDCA is adequately like TPA to be utilized in existing PET polymerization plants, making this innovation effectively adaptable to a modern scale.

Even however PEF is without a doubt a fascinating material, a few issues identified with the creation and control of FDCA (for example, its helpless dissolvability in like manner natural solvents or its inclination to decay at temperatures more prominent than 180°C) have made some synthetic organizations look for options.

The main one, created by the compound monster DuPont, is PTF. This polymer is gotten by the response between the Furan Dicarboxylic Methyl Ester (FDME), fructose inferred compound, and the 1, 3-Propanediol (Bio-PDO), another bio-based particle protected by DuPont and presently utilized by the brand Sorona to deliver outside coats.

As per accessible information, both PEF and PTF ought to be great possibility to supplant PET in the food bundling industry. To see them in our shopping basket, nonetheless, we should stand by a couple of years more.

Indeed, the creation of FDCA is presently caught in the plausibility stage and the principal modern scale creation is normal no sooner than 2024. As respects to PTF, DuPont is a stride ahead as it has as of now opened the world's first bio-based FDME pilot creation office in Decatur, Illinois (USA) in April 2018.

Both PEF and PTF can be delivered utilizing 100% inexhaustible sources. They are recyclable and outwardly like standard PET yet with obviously better mechanical and gas boundary execution. PEF creation ought to be incorporated into existing PET polymerisation lines, while PTF is now a stride ahead in the way towards modern creation.

These materials are not yet accessible available and the circumstance for their industrialisation is unsure. Besides, most likely they won't be recyclable in the standard PET stream and this could be a major obstruction for their reception. At long last, a few worries are arising in mainstream researchers identified with the relocation of certain mixtures from the compartment dividers into the food item.

1.3. BIO-PET

The fundamental thought of this methodology is to utilize non-oil based natural substances to separate something like one of the two PET base parts. A few arrangements are now accessible available, for example, some BIO-PET tars in which MEG monomers are delivered from horticultural items including molasses, corn and bagasse (the dry rest of sugarcane after its juice is taken out).

Despite what is generally expected, right up 'til today there is still no reasonable modern interaction to remove bottle-grade BIO-TPA from sustainable assets, notwithstanding, much examination is in progress on the subject. The majority of this objectives p-xylene (pX), the petrochemical forerunner for terephthalic corrosive.

An incomplete accomplishment on this way has been accomplished by Toray Businesses Inc., which dispatched the creation of a full BIO-PET with bio-based TPA in 2012 (regardless of whether the delivered polymer is appropriate just for material applications).

Various types of plastic can corrupt at various occasions, however the normal time for a plastic jug to totally debase is somewhere around 450 years. It can even take a few containers 1000 years to biodegrade.

One more methodology is addressed by the work did by the Division of Sub-atomic Study of Gumma College in Japan, which fostered a fresh out of the box new interaction to acquire bio-based TPA from furfural, a natural compound delivered from unappetizing cellulosic biomass.

Returning to the market best in class, the main industrially accessible answer for food-grade BIO-PET is that utilizing BIO-MEG to supplant conventional oil-based MEG. A few instances of containers currently accessible available are those of the Japanese 'Suntory Tennensui' mineral water, the Italian 'Levissima' water and Coca-Cola's exceptional water brand 'Valpré.

The primary benefit of this methodology is that these jugs, containers or plate have similar optical and actual properties as customary virgin PET while lessening the utilization of non-inexhaustible assets by around 30 %. What's more, the holders remain completely recyclable in the standard PET stream.

Issues identified with BIO-PET are as old as standard PET, specifically the high natural effect when holders are not appropriately reused since Bio-PET doesn't biodegrade. Besides, this arrangement will just truly be a green option once bio-based TPA is broadly accessible in the market too.

CHAPTER 66
CONCULSION

1.1 Conclusion

PET has given an insurgency to the packaging business closing decagons. In any case, beating the cutting-edge ecological issues of lessening fossil assets and the developing difficulties identified with plastic waste require new arrangements. PET is a difficult to replace material due to its properties and low pricing but it has become a necessity to replace PET due to its effects on the habitat as it is non decomposable.

Compound organizations and bundling makers are in a joint work to foster greener materials and a few options in contrast to standard PET are currently in transit with qualities and shortcomings. One thing is beyond a shadow of a doubt: in the following not many months or a long time, we will see another transformation in the food packaging market.

By the above study, we can conclude that the usage of PET will be reduced in the coming years. BIO-PET, PEF and PLA can replace PET on a certain level but to replace it completely there is need to be improvement made in these material.

CHAPTER 7

LIST OF PUBLICATION

Our paper has been recommended for consideration for publication in INTERNATIONAL CONFERENCE ON MATERIALS MACHINES AND INFORMATION TECHNOLOGY-2022 (ICMMIT) which is Scopus indexed Publication of Springer. ICMMIT helps in publication of newest development in core engineering background. Easy access is provided with high quality work. Paper registered in ICMMIT for publication polishes different features, subfields and latest challenge of mechanical engineering. Different topics related to mechanical engineering are been considered in this publication that includes: Engineering Design, Automotive Engineering, Nanotechnology and Micro Engineering, Theoretical and Applied Mechanics, Engineering Thermodynamics/Heat and Mass Transfer, Material engineering etc.

References

[1] Chemical compounds and toxicological assessments of drinking water stored in polyethylene terephthalate (PET) bottles: A source of controversy reviewed. By-Cristina Bach, Xavier Dauchya, Marie-Christine Chagnon, Serge Etienne, 2011.

[2] Leaching of antimony from polyethylene terephthalate (PET) bottles into mineral water. By- Szilvia Keresztes, Enikő Tatár, Victor G.Mihucz, István Virág, Cornelia Majdik Gyula Záray,2013.

[3] Comparative life cycle assessment and social life cycle assessment of used polyethylene terephthalate (PET) bottles in Mauritius. By- Rajendra Kumar Foolmaun & Toolseeram Ramjeeawon, 2008

[4] Comparative life cycle assessment of fossil and bio-based polyethylene terephthalate (PET) bottles. By LuyiChen, Rylie E.O.Pelton, Timothy M.Smith, 2007.

[5] Effect of temperature on the release of intentionally and non-intentionally added substances from polyethylene terephthalate (PET) bottles into water: Chemical analysis and potential toxicity. By- CristinaBach, Xavier Dauchy, 2008.

[6] Impact of neonatal exposure to the ERaagonist PPT, bisphenol-A or phytoestrogens on hypothalamic kisspeptin fiber density in male and female rats. Pen˜ alver, A., Pocurull, E., Borrull, F., Marce´ ,R.M., 2000.

[7] Determination of phthalate esters in water samples by solid-phase microextraction and gas chromatography with mass spectrometric detection. Journal of Chromatography. Pinto, B., Reali, D., 2009.

[8] Screening of estrogen-like activity of mineral water stored in PET bottles. International Journal of Hygiene and Environmental Health Reimann, C., Birke, M., Filzmoser, P., 2010.

[9] PET: a review on the synthesis processes, degradation mechanisms and its recycling. [10] Rule, M., Shi, Y., Huang, X., 2001.

[11] Acetaldehyde Content of Melt-processed Polyesters United Sorptionedesorption of aromas on multi-use PET bottles. A test procedure. Packaging Technology and Science Sax, L., 2010.

[12] Does the reuse of PET bottles during solar water disinfection pose a health risk due to the migration of plasticisers and other chemicals into the water? Seroˆdio, P., Nogueira, J.M.F.,2006.

[13] Considerations on ultra-trace analysis of phthalates in drinking water. Shao, B., Han, H., Hu, J., Zhao, J., Wu, G., Xue, Y., Ma, Y., Zhang, S., 2005.

[14] Determination of alkylphenol and bisphenol A in beverages using liquid chromatography/electrospray ionization tandem mass spectrometry. Sheftel, V.O., 2000.

[15] Indirect Food Additives and Polymers: Migration and Toxicology. American Chemical Society, Boca Raton, USA. Shotyk, W., Krachler, M., 2007.

[16] Contamination of bottled waters with antimony leaching from polyethylene terephthalate(PET) increases upon storage. Environmental Science and Technology. Shotyk,W., Krachler, M., Chen, B., 2006.

[17] Contamination of Canadian and European bottled waters with antimony from PET containers. Journal of Environmental Monitoring. Skjevrak, I., Brede, C., Steffensen, I.L., Mikalsen, A., Alexander, J.,Fjeldal, P., Herikstad, H., 2005.

[18] Non-targeted multi-component analytical surveillance of plastic food contact materials: identification of substances not included in EU positive lists and their risk assessment. Buettner, A., Groetzinger, C., 2009.

[19] Characterization and identification of a plastic-like off-odor in mineral water. Sugaya, N., Nakagawa, T., Sakurai, K., Morita, M., Onodera, S., 2001.

[20] Analysis of aldehydes in water by head space-GC/MS. Tadmor, Z., Gogos, C.G., 2006.

[21] Principles of Polymer Processing. Tombesi, N.B., Freije, H., 2002.

[22] Application of solid-phase microextraction combined with gas chromatographyemass pectrometry to the determination of butylated hydroxytoluene in bottled drinking water. Tombesi, N.B., Freije, R.H., Augusto, F., 2004.

---*-[24] Factorial experimental design optimization of solid phase microextraction (SPME) conditions for analysis of butylated hydroxytoluene (BHT) in bottled water. Journal of theBrazilian. Toyo'oka, T., Oshige, Y., 2000.

[25] Determination of alkylphenols in mineral water contained in PET bottles by liquid chromatography with coulometric detection. Wagner, M., Oehlmann, J., 2011.

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Paper 2
Report

PLUG-IN ELECTRIC VECHILES AS AN AUXILIARY POWER SUPPLY SYSTEM FOR MEDICAL LABORATORIES

Capstone Project-II Report submitted in

Partial fulfillment for the award of the

Degree of

BACHELOR OF TECHNOLOGY

Submitted by

MOHAMMAD USMAAN ALI HASHMI

(19021012109)

RAHUL PATWAL

(19021012108)

IN

MECHANICAL ENGINEERING

SCHOOL OF MECHANICAL ENGINEERING

Under the Supervision of

MR. KAPIL RAJPUR

(Established under Galgotias University Uttar Pradesh Act No. 14 of 2011)

MAY- 2022

SCHOOL OF MECHANICAL ENGINEERING

BONAFIDE CERTIFICATE

Certified that this project report **"PLUG-IN ELECTRIC VECHILES AS AN AUXILIARY POWER SUPPLY SYSTEM FOR MEDICAL LABORATORIES"** is the bonafide work of "**MOHAMMAD USMAAN ALI HASHMI (19021012109), RAHUL PATWAL (19021012108),** who carried out the project work under my supervision.

SIGNATURE OF DEAN SIGNATURE OF SUPERVISOR

APPROVAL SHEET

This thesis/dissertation/project report entitled titled **PLUG-IN ELECTRIC VECHILES AS AN AUXILIARY POWER SUPPLY SYSTEM FOR MEDICAL LABORATORIES** by- **MOHAMMAD USMAAN ALI HASHMI-19021012109, RAHUL PATWAL-19021012108** is approved for the degree of bachelor of technology in mechanical engineering.

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Supervisor

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Dean

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Date: _____

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Statement of Project Report Preparation

9. Project report title:**“** PLUG-IN ELECTRIC VECHILES AS AN AUXILIARY POWER SUPPLY SYSTEM FOR MEDICAL LABORATORIES”**.**
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(Signature of the student)

Name: (RAHUL PATWAL)
Roll No: (19021012108)

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ABSTRACT

As the market of electric vehicles is expending globally, Electric Vehicles are not only environment friendly and efficient but they can also be used as an alternative source of power supply.

In this paper we have proposed the concept of using Plug-in Electric Vehicle as Auxiliary Power Supply System for medical Laboratories. The way of converting an Electric Vehicles into an alternative power supply system is discussed. We took the data from different laboratories and calculated the average amount of usage per day including all the major equipment that are required. The number of hours and days those laboratories can be operated on a fully charged 30kWh, 40kWh, 50kWh and 80kWh vehicles with batteries setup for bidirectional charging is been calculated respectively. The obtained result proves the concept of Auxiliary Power Supply System.

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CHAPTER 1

INTRODUCTION

Electric Vehicles are rapidly expanding their mark on Automobile sales chart worldwide. Governments around the globe are introducing various schemes and major subsidies on the purchase Electric Vehicles, few countries has even pledged to discontinue the production of ICE vehicles. The reason behind this speedy growth is the gas emission produced by ICE vehicles which is one of the major cause of global warming.

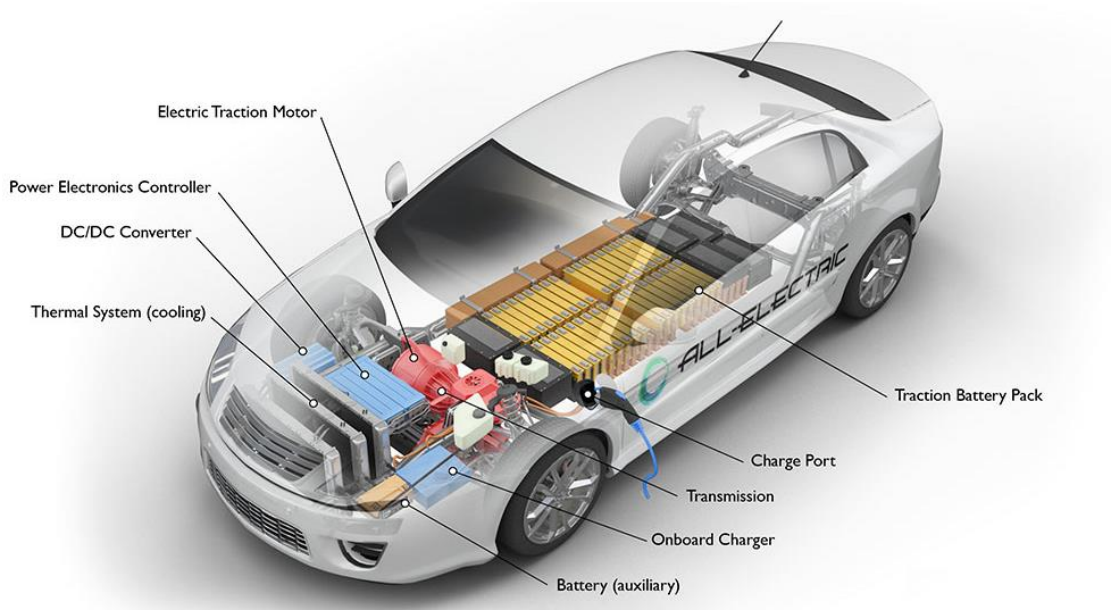

Figure 1- *Inside an Electric Vehicle*

CHAPTER 2

LITERATURE REVIEW

It's difficult to attribute electric car innovation to a single person or country. Rather, a series of jumps from the battery to the electric engine brought the first electric car onto the road in the 1800s.

In 1828 Anyos Jedlik designed an electric motor, and, utilizing his electric motor, he made the little electric vehicle. Somewhere in the range of 1832 and 1839, Scottish designer Robert Anderson additionally fostered a rough electric carriage.

William Morrison, a scientist from Des Moines, Iowa, invented the first workable electric automobile in the United States in 1890. His six-seater vehicle was little more than an electric cart with a peak speed of 14 miles per hour, but it sparked interest in electric cars.

During the next several years, electric vehicles from a number of automakers began to arrive in the United States. New York City even had an electric taxi fleet of approximately 60 vehicles. Electric cars had reached their pinnacle by 1900, accounting for around 33% of all vehicles on the road. For the following 10 years, they continued to provide fantastic bargains.

In 1996, the primary electric vehicle was a three-wheeler, concocted by Scooter's India Pvt Ltd, and it was named VIKRAM SAFA. Around 400 vehicles were made and sold. In 2000, BHEL fostered an eighteen-seater electric transport, which became famous as well. Then, at that point, approx. 200 electric buses were made and ran in Delhi. However, it didn't do that well in the market as it required a significant expense for the battery and it was not enduring.

Electric vehicles appeared in the nineteenth century. Prior, they didn't do that well in the market due to its significant expense, low speed, and short-range. So at first, the interest declined around the world. Nevertheless, they have been utilized for transportation and public vehicle, particularly as railways.

As the worry for the climate expanded in the 21st century, internal combustion vehicles emanate a great amount of injurious gasses and are staggeringly dangerous to the environment.

While each of the electric car industry's start-ups and pauses in the second half of the twentieth century helped to illustrate to the world the potential of innovation, it was not until the early twenty-first century that the electric vehicle truly recovered. Depending on who you ask, one of two events prompted the present interest in electric vehicles.

According to many, the advent of the Toyota Prius marked the turning point. When it was debuted in Japan in 1997, the Prius was the world's first effectively produced hybrid electric car. The Prius was shipped all over the world in 2000, and it became a celebrity favourite, helping to enhance the vehicle's popularity. The Energy Department's inquiry confirmed that Toyota employed a nickel metal hydride battery to make the Prius a reality. In the previous decade, rising gasoline prices and increased worries about carbon emissions helped the Prius become the top-of-the-line crossover.

Tesla Motors' statement in 2006 that it would begin offering an opulent electric gaming vehicle capable of travelling over 200 miles on a single charge revolutionised electric vehicles. Tesla obtained a $465 million loan from the Department of Energy's Loan Programs Office in 2010 to build a factory in California, which it paid back nine years early. Tesla has gained widespread acceptance for its automobiles in the short period since then, and has grown to become California's largest automobile company.

Over the next several years, several manufacturers began producing electric vehicles around the world; yet, purchasers were still confronted with one of the early challenges of the electric vehicle: where to charge their cars rapidly. To accommodate the demand, automakers and other private companies have introduced their own electric vehicle models and features.

When it comes to acquiring an electric vehicle, buyers now have more alternatives than ever before. It's tough to say where electric vehicles will go in the future, but they clearly have a lot of potential for creating a more sustainable future.

CHAPTER 3

COMPARITION OF IC ENGINE WITH ELECTRIC VECHILE IN TERMS OF: POLLUTION, OPERATION, PRICING AND MAINTAINANCE

A gas-powered engine burns fuel to generate heat, which in turn generates power to propel a vehicle forward. An electric powertrain, on the other hand, converts electrical energy into mechanical energy. When the greater outflows associated with the production of the electric powertrain are included, the electric powertrain is less polluting than the gas-powered motor.

Vehicles with an electric powertrain are known as Zero Emission Vehicles. However, ingesting gasoline in a gas-powered vehicle releases massive amounts of toxins.

Because of the materials and manufacturing of the lithium-particle battery, the production of an electric powertrain produces higher outflows than the production of a gas-powered motor. In any event, the increased discharges resulting from the development of the electric powertrain may be swiftly disproved.

In comparison to a typical IC engine vehicle, a Battery Electric Vehicle (BEV) only requires 5000 miles of driving to offset the excess discharges caused by artificial weather changes. In comparison to a comparable petroleum car, a conventional long-range BEV travels 19,500 miles. Based on typical vehicle usage, a half-year of driving for the medium-size, mid-range BEV and 15 months for the standard, long-range BEV is required to entirely invalidate the higher emissions during creation. When externalities are taken into account, the electric powertrain is less filthy over longer periods.

The global temperature change resulting from the construction of electric vehicles is decreasing as automakers acquire insight and improve manufacturing efficiency. Emissions from operating electric vehicles will continue to decline while the use of sustainable energy such as tidal energy and wind energy grows. In a variety of ways, the electric car sector can reduce dangerous atmospheric deviation discharges caused by creation. These include improvements in battery production efficiency and reuse, an increase in the use of alternative, renewable power sources, and use of elective battery sciences that require less energy-concentrated components.

The normal productivity of the present Internal Combustion engine, in particular the way how viably they work with burned-through fills, is about 26% to 34 percent. Electric motors, then again, have more than triple effectiveness almost about 89%.

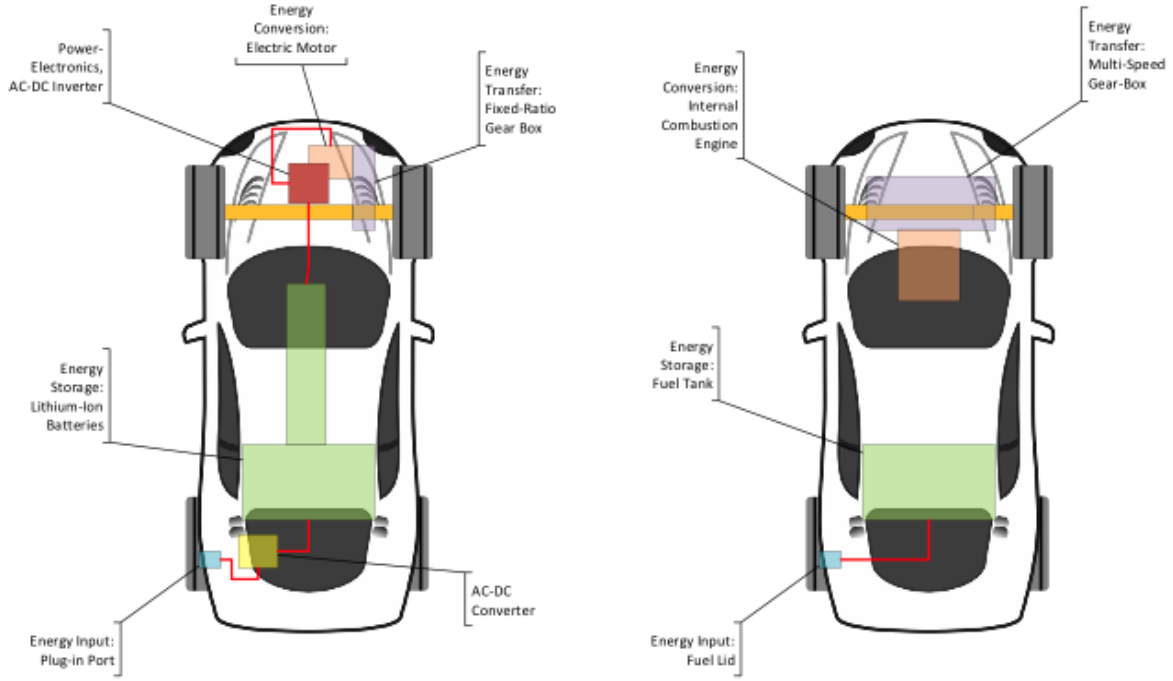

Figure 2- *Electric Vehicle vs IC Engine Vehicle*

Because of their firm regenerative limit, EVs have fewer moving components and do not require oil or filter changes. They also have reduced brake cushion wear. This makes EV activities and maintenance much easier and more useful.

The cost of the battery pack, which is virtually more expensive than the drivetrain of an Internal Combustion Engine Vehicle, is the single biggest backer of EVs' high purchase pricing (ICEV). However, battery costs are expected to fall in the future, making EVs less expensive to own and reduce their total cost of ownership. When compared to an ICEV, EVs have cheaper depreciation and interest costs when purchasing another EV. When compared to an ICEV, this could result in the total cost of ownership for a used EV being significantly lower.

CHAPTER 4

VARIOUS TYPES OF EV BATTERIES AND THEIR CAPACITY

1.Various battery types in EVs:

A.) Lithium-ion batteries:

They are the most complex batteries used in electric vehicles. They're also in phones and PCs. They have a good weight-proportioning ability, great energy economy, and good temperature control. Lithium-ion batteries are recyclable. These batteries are used in AEV and PHEV cars. Lithium-ion batteries are becoming more common in future electric vehicles. The LiFePO4 type was identified to be ideal due to its synthetically stable nature after focusing on the dangers of the battery's shakiness. Furthermore, LiFePO4 is a naturally harmless compound. Li-particles like LiCoO2, LiMn2O4, and Li (Ni1/3n1/3Co1/3) O2 could have warm and cheat difficulties. Lead-corrosive batteries continue to be employed in a large percentage of the market due to their inexpensive cost.

B.) Nickel-metal hydride batteries:

This battery is used in the majority of hybrid electric vehicles. It is an example of mature battery development. Nickel metal hydride batteries have a longer future than lithium-molecule and lead-acid batteries. Hybrid electric vehicles do everything they can to avoid getting power from an external module source and, in some cases, rely on fuel to recharge the battery, removing them from the electric vehicle category.

The life-cycle of nickel-metal hydride batteries is longer than that of lithium-molecule or lead-destructive batteries. They are also protected and vulnerable to mauling. They are extremely strong. They are extravagant, have a high self-discharge rate, and a low power thickness, which is the biggest drawback, as well as the fact that they emit fundamental heat at high temperatures.

As a result of these limitations, these batteries are less appealing for battery-controlled electric cars, and therefore are not ideal for AEVs.

C.) Lead-acid batteries:

Lead-acid batteries are also a well-developed technology. They have excellent execution. When compared to various batteries, they are essentially more economical. They are stable and reliable, but their future is limited.

Furthermore, their performance in cold weather is subpar. They can't be employed as a primary energy collecting structure because of their low power thickness, but they are widely used as a supplement accumulating structure in commercial cars.

D.) Ultra-Capacitors:

In the conventional sense, ultra-capacitors are not batteries. They hold charged liquid between a cathode and an electrolyte after taking everything into consideration. The cutoff for energy accumulation increases as the liquid surface district develops. Ultra-capacitors have a much higher breaking point capacitance and lower voltage restrictions than other types of capacitors, and they may be charged extremely quickly. They have a 10000 to 1 million cycle life expectancy. Working temperatures range from 40 to 150 degrees Fahrenheit. Ultra-capacitors have a far faster charge release rate than lithium-ion batteries. Ultra-capacitors can also provide additional power to electric vehicles during acceleration and regenerative braking.

2.Capacity of an EV battery

An EV's battery limit is communicated as far as kilowatt-hours, which is abridged as kWh. More is better here. Picking an EV with a higher kWh rating resembles purchasing a vehicle that accompanies a bigger fuel tank in that you'll have the option to travel for additional miles prior to requiring a "top off." But know that in view of the manner in which EVs work, you'll never really approach the full battery limit. That is on the grounds that the vehicle's the board framework keeps the battery from either becoming 100% completely energized or 100% released to safeguard its effectiveness and broaden its usable life. EV batteries span from 28.9 kWh to roughly 200 kWh.

CHAPTER 5

INSIDE AN ELECTRIC VECHILE POWERTRAIN

An EV powertrain has 60% less parts then an ICE powertrain.

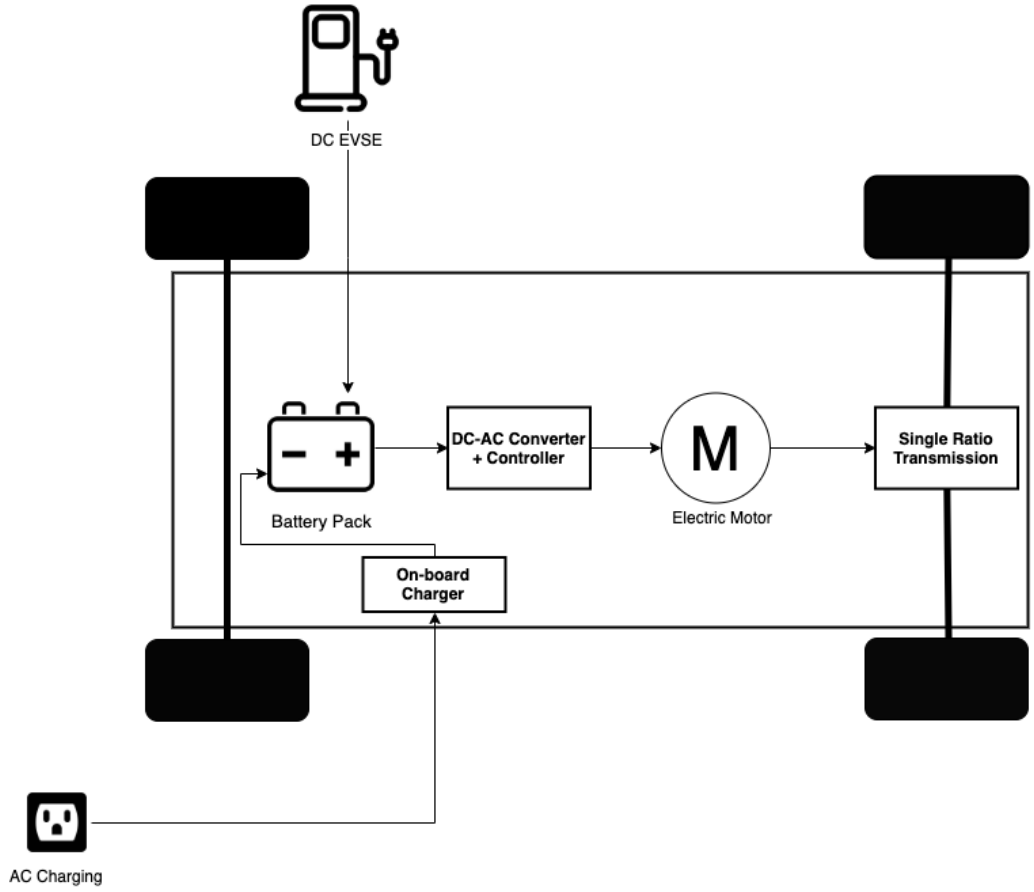

Figure 3- *Components of an Electric Vehicle*

A.) Battery Pack

The battery pack is comprised of numerous Lithium-particle cells and stores the energy expected to run the vehicle. Battery packs give direct current (DC) supply.

B.) DC-AC Converter

The DC provided by battery pack is changed over to AC and provided to the electric engine. This power move is overseen by a modern engine control component (likewise alluded to as Powertrain Electronic Control Unit) that controls the recurrence and greatness of the voltage provided to the electric engine to deal with the speed and speed increase according to driver's directions imparted by means of speed increase/brakes.

C.) Electric Motor

Changes electric power to mechanical power that is conveyed to the tyres by means of single proportion transmission. Numerous EVs utilize engine generators that can perform recovery too.

D.) On-board Charger

Changes over AC got through charge port to DC and controls how much current streaming into the battery pack.

E.) Battery Management System (BMS)

A BMS consistently screens the condition of the battery and is answerable for going to fundamental lengths in the event of a breakdown. BMS performs cell adjusting to convey greatest effectiveness from the battery pack. It is liable for correspondence with other ECUs and sensors, just as EVSEs to control the charging input, really take a look at the present status of charge and offer information about battery details.

F.) DC-DC Converter

A battery pack conveys a proper voltage, however the prerequisite of various frill frameworks (for example wipers, lights, infotainment framework, reflect control) in the EV would shift. The DC-DC converter disperses capacity to various frameworks by changing over the result

power from battery pack to the normal level. After change, power is conveyed to individual more modest ECUs by means of wiring saddle.

G.) Thermal Management System

Liable for keeping up with ideal working temperature range for powertrain parts.

H.) Body Control Module (BCM)

The BCM is answerable for managing and controlling the elements of electronic embellishments, for example, power windows, mirrors, security and vehicle access control

CHAPTER 6

Electricity driven equipment used at Medical Laboratory

i. Compound Microscope

A compound magnifying lens is a powerful (high amplification) magnifying lens that utilizes a compound focal point framework. A compound magnifying lens has different focal points: the goal focal point (regularly 4x, 10x, 40x or 100x) is compounded (duplicated) by the eyepiece focal point (ordinarily 10x) to acquire a high amplification of 40x, 100x, 400x and 1000x. Higher amplification is accomplished by utilizing two focal points rather than simply a solitary amplifying focal point. While the eyepieces and the genuine focal points make high amplification, a condenser underneath the stage shines the light straightforwardly into the example.

ii. Electron Microscope

Electron microscopy (EM) is a technique for getting significant standard pictures of natural and non-regular models. It is utilized in biomedical exploration to examine the nitty gritty design of tissues, cells, organelles and macromolecular edifices.

iii. Centrifuge Machine

In medical laboratories, a centrifuge is used to separate liquid or gaseous substances based on thickness. Separation is achieved by rapidly spinning a container containing material, causing heavier items to be pushed to the outside of the vessel by centrifugal force. To purify cells, subcellular organelles, viruses, proteins, and nucleic acids, most laboratories, ranging from academic to clinical to research, use this method. The intended usage or rotor design of centrifuges are used to classify them. Researchers might choose from large ground models to micro-centrifuges.

iv. Semi-auto Analyser

A biochemistry analyzer is a type of clinical chemical analyzer that evaluates the components of a biological sample such as blood, urine, plasma, and other fluids. While this process was first carried out manually by lab technicians and analysts, it grew tiresome and inefficient over time. The requirement for an analysing machine was identified in order to eliminate delays in sending test results for each sample. An Automatic Biochemistry Analyzer was created as a result of technological advancements.

v. Haemoglobin Machine

Haemoglobin is an iron-content oxygen-carrying protein found in the red blood cells (erythrocytes) of almost all vertebrates and certain invertebrates' organs. The blood transports oxygen from the breathing organs to the rest of the body. The oxygen is subsequently released, allowing aerobic respiration to provide energy to an organism's duties in the metabolic process. A healthy human has 12 to 20 grammes of haemoglobin in every 100 mL of blood.

vi. Widal Mixer

The Widal test is an agglutination test that identifies serum agglutinins (H and O) in typhoid and paratyphoid fever patients' serum. When culturing facilities are unavailable, the Widal test is a reliable alternative that can help diagnose typhoid disease in endemic locations. It was created in 1896 by Georges Ferdinand Widal. Antibodies to O and H are evaluated in the patient's serum (agglutinins).

vii. Incubator

An incubator is a device that is used to grow and keep microbiological or cell cultures alive. The temperature, humidity, and other factors inside the incubator, like as CO2 and oxygen content, are all kept at appropriate levels. Incubators are used to culture both bacterial and eukaryotic cells and are vital for many experimental work in cell biology, microbiology, and molecular biology.

viii. Colorimeter

A colorimeter can be used to detect light wave absorption.The intensity of visible wavelength electromagnetic radiation is measured after transmission or reflection by an object or solution during colour measurement.Because the amount and colour of light absorbed or transmitted are affected by the characteristics of the solution, including the concentration of particles in it, such a test can help determine chemical concentrations.

ix. CBC Machine

A CBC machine is a blood testing machine that is used for complete blood count to assess overall health and identify a variety of illnesses, such as anaemia, infection, and leukaemia. A complete blood count test assesses a variety of blood components and characteristics, including red blood cells, which transport oxygen.

CHAPTER 6
CONCULSION

1.2 Conclusion

Through this research paper we can conclude that an electric vehicle with batteries setup for bidirectional charging can be used as an Auxiliary Power Supply System for a medical laboratory using a special charging unit called bidirectional charging system.

Using our collected data from 5 different medical laboratories, a lab with an average daily use of 14.4 kWh electric vehicle can power up to:-

A vehicle with **30kWh battery** can be used to supply power to a lab for **maximum 50 hours or 2 days and 2 hours**.

A vehicle with **40kWh battery** can be used to supply power to a lab for **maximum 66.6 hours or 2 days, 18hours and 36minutes**.

A vehicle with **50kWh battery** can be used to supply power to a lab for maximum **83.3 hours or 3 days, 11 hours and 18 minutes**.

A vehicle with **80kWh battery** can be used to supply power to a lab for **maximum 133.3 hours or 5 days, 13 hours and 18 minutes**.

References

1. Liu YJ, Chang TP, Chen HW, Chang TK, Lan PH (2014) Power quality measurements of low-voltage distribution system with smart electric vehicle charging infrastructures. In: Proceedings of international conference on harmonics and quality of power, ICHQP, pp 631–635

2. Martinez CM, Hu X, Cao D, Velenis E, Gao B, Wellers M (2017) Energy management in plug-in hybrid electric vehicles: recent progress and a connected vehicles perspective. IEEE Trans Veh Technol 66(6):4534–4549

3. Chen C, Duan S (2015) Microgrid economic operation considering plug-in hybrid electric vehicles integration. J Mod Power Syst Clean Energy 3(2):221–231

4. International Energy Agency (2016) Global EV outlook 2016 electric vehicles initiative. IEA, p 51

5. Ahmad F, Alam MS, Shahidehpour M (2017) Optimal placement of electric, hybrid and plug-in hybrid electric vehicles (xEVs) in Indian power market. In: 2017 Saudi Arabia smart grid (SASG), pp 1–7

6. Shahidinejad S, Filizadeh S, Bibeau E (2012) Profile of charging load on the grid due to plug-in vehicles. IEEE Trans Smart Grid 3(1):135–141

7. Gupta M, Rafat Y, Alam MS (2017) Well to wheel cum tailpipe emission analysis: ICE vs xEV. In: SAE international symposium on international automotive technology 2017

8. Liu C, Chau KT, Wu D, Gao S (2013) Opportunities and challenges of vehicle-to-home, vehicle-to-vehicle, and vehicle-to-grid technologies. Proc IEEE 101(11):2409–2427

9. Ahmad F, Alam MS, Asaad M (2017) Developments in xEVs charging infrastructure and energy management system for smart microgrids including xEVs. Sustain Cities Soc 35:552–564

10. Ashtari A, Bibeau E, Shahidinejad S, Molinski T (2012) PEV Charging profile prediction and analysis based on vehicle usage data. IEEE Trans Smart Grid 3(1):341–350

11. Rezvanizaniani SM, Liu Z, Chen Y, Lee J (2014) Review and recent advances in battery health monitoring and prognostics technologies for electric vehicle (EV) safety and mobility. J Power Source 256:110–124

12. Chen L, Chung CY, Nie Y, Yu R (2013) Modeling and optimization of electric vehicle charging load in a parking lot. In: 2013 IEEE PES Asia-Pacific power and energy engineering conference (APPEEC), pp 1–5

13. Ahmad F, Alam MS (2017) Feasibility study, design and implementation of smart polygeneration microgrid at AMU. Sustain Cities Soc 35:309–322

14. Khan S, Ahmad A, Ahmad F, Shafaati Shemami M, Saad Alam M, Khateeb S (2017) A comprehensive review on solar powered electric vehicle charging system. Smart Sci 6(1):1–26
15. Asaad M, Ahmad F, Saad Alam M, Rafat Y (2017) IoT enabled electric vehicle's battery monitoring system. In: Proceedings of the 1st EAI international conference on smart grid assisted internet of things, no 8
16. Wu X, Hu X, Moura S, Yin X, Pickert V (2016) Stochastic control of smart home energy management with plug-in electric vehicle battery energy storage and photovoltaic array. J Power Source 333:203–212
17. Kong P-Y, Karagiannidis GK (2016) Charging schemes for plug-in hybrid electric vehicles in smart grid: a survey. IEEE Access 4(99):6846–6875
18. Zhang T, Wang X, Chu CC, Gadh R (2016) User demand prediction and cloud-based smart mobile interface for electric vehicle charging. In: Asia-Pacific power and energy engineering conference APPEEC, pp 348–352
19. Nworgu OA, Chukwu UC, Okezie CG, Chukwu NB (2016) Economic prospects and market operations of V2G in electric distribution network. In: Proceedings of the IEEE power engineering society transmission and distribution conference, 2016, pp 1–5
20. Gong C et al (2015) Study on the impacts and analysis of EV and PV integration into power systems. In: 2015 5th international conference on electric utility deregulation and restructuring and power technologies (DRPT), pp 2454–2458

21. Wu X, Hu X, Yin X, Moura SJ (2018) Stochastic optimal energy management of smart home with PEV energy storage. IEEE Trans Smart Grid 9(3):2065–2075
22. Shemami MS, Alam MS, Asghar MSJ (2017) Load shedding mitigation through plug-in electric vehicle-to-home (V2H) system. In: 2017 IEEE transportation and electrification conference and expo, ITEC 2017, pp 799–804
23. Shafaati Shemami M, Saad Alam M, Asghar MSJ (2017) Fuzzy control assisted vehicle-to-home (V2H) energy management system. Smart Sci 477:1–15
24. Shin H, Baldick R (2017) Plug-in electric vehicle to home (V2H) operation under a grid outage. IEEE Trans Smart Grid 8(4):2032–2041
25. Wu X, Hu X, Moura S, Yin X, Pickert V (2016) Stochastic control of smart home energy management with plug-in electric vehicle battery energy storage and photovoltaic array. J Power Source 333:203–212
26. Sun C, Sun F, Moura SJ (2015) Data enabled predictive energy management of a PV-battery smart home nanogrid. In: 2015 American control conference (ACC), pp 1023–1028
27. Goli P, Shireen W (2015) Plug in electric vehicles in smart grids. Springer, Berlin

28. Said D, Cherkaoui S, Khoukhi L (2015) Scheduling protocol with load managementfor EV charging. In: 2014 IEEE global communications conference GLOBECOM 2014, pp 362–367
29. The Cost of Solar Will Drop Another 25% by 2022 [Online]. Available: https://futurism.com/the-cost-of-solar-will-drop-another-25-by-2022/. Accessed 22 Nov 2017
30. Jhunjhunwala A, Lolla A, Kaur P (2016) Solar-dc microgrid for indian homes: a transforming power scenario. IEEE Electrif Mag 4(2):10–19
31. Hu X, Li SE, Yang Y (2016) Advanced machine learning approach for lithium-ion battery state estimation in electric vehicles. IEEE Trans Transp Electrif 2(2):140–149

32. Optimal design of electric vehicle battery recycling network – From the perspective of electric vehicle manufacturers. (2020)

Lei Wang, Xiang Wang, Wenxian Yeng

33. Key Challenges and Opportunities for Recycling Electric Vehicle Battery Materials (2020) Alexandre Beaudet, François Larouche, Kamyab Amouzegar, Patrick Bouchard and Karim Zaghib.

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