

AIRBOOST TECHNOLOGY

FLYING CAR MECHANISM

ANTI FIRE TECHNOLOGY

THERMAL ENERGY CONVERSION

GEARLESS TRANSMISSION



AUTOMOBILE ARCHITECTURE

"THE FUTURE OF AUTOMOBILE INDUSTRIES"

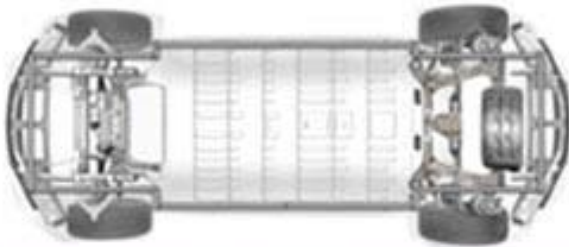
- BY Dr.SHRIRAM PRABHAKAR



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ACKNOWLEDGMENT

Acknowledgment is where I credit and acknowledge the sites that I took as reference during the research process. The automobile architecture cognates multiple details about automobiles and the industry to be unique, performing for soul and passion economically and effectively since it is not normalized, but user defined, consanguine of brand. The development of technologies required the search for multiple details, because automobile architecture is new of its kind and forms the base of industry 5.0 technologies. It fine tunes the abrupt, normalized cut in the design to enhance speed, reduce efforts, fuel efficiency and more by assuring the safety naturally, not expecting something out of purpose and adding more components that make it resounding. Well, the process was educational for me to gain most of my knowledge about automobiles. It is my responsibility to acknowledge the websites from where I took notes and learned information, which is fulfilled in this acknowledgment chapter.

EVOLUTION OF CARS

Notes on most details were taken from the website called Britannica and Wikipedia which are probably the best sites to take reference from, as they are considered the most trusted webpages online. Because the automobile industry has been around for so long, it is better to double check on some of the important and iconic moments in the whole history of automobiles, which is exactly the reason why I had to refer both Britannica and Wikipedia, to make sure and confirm about the details. Reading through the happenings of the evolution of cars helped me realize how advanced and comfortable the modern day automobiles are, which makes me appreciate the job that manufacturers have done to take this leap to stand where we are right now in making the automobile advanced and comfortable.

EVOLUTION OF INTERNAL COMBUSTION ENGINE

To know the functionalities of an internal combustion engine and the parts that an internal combustion engine uses, I referred to two websites called how stuffs work and Wikipedia. The biggest advancement to the automobiles made to this date is the internal combustion engine. The introduction of the internal combustion engine is one of the most important moments in the

automobile history. The engine helped in achieving so many different varieties of requirements, all at once and spread its prospects and durability into the motorsport's world. Since the introduction of the internal combustion engine has gone through multiple technological advancements, to make it fuel efficient, eco-friendly and capable to perform and respond to mods and tunes better. The modern day internal combustion engine is nothing like the original internal combustion engine, it started from a basic carburetor internal combustion engine that evolved to MPFI (Multi Point Fuel Injection), to SOHC (Single Over Head Cam), to DOHC (Dual Over Head Cam) and to an ECU built operated internal combustion engine that helps in tuning the engine the way the consumers wishes to, increasing engines flexibility and versatility. Learning about the internal combustion engine, the parts the engine uses to function and importance that each part holds in the engine for its combustion process helped me redesign the air boost technology better.

GEARLESS TRANSMISSION

Evolution in transmission also hold an important part in designing the gearless transmission, it helped in learning the importance of a transmission in a vehicle's functioning and it also helped in knowing how an alternative component can help get rid of the gear transmission in the automobile. The research was done with the help of Wikipedia, Meineke and how stuffs work. Reading the evolution of transmission, the automobiles powered by the steam engines before internal combustion engine were designed to drive without a transmission, but this upgrade was introduced during the time ICE gained its popularity by being economical and advantageous over the steam engine. ICE needs transmission to reduce its engine noise and increase fuel efficiency, transmission was invented with multiple gears each gears being in different ratios, allowing the driver to select the desired gear at the moment of driving and achieve higher speeds with low fuel consumption. I found the solution that can remove the transmission from the vehicle, by lowering the numerical gear ratio of the differential gear, which benefits in achieving higher speeds, greater fuel efficiency and less stress added to the engine, which is the "gearless transmission".

ARCHIMEDES PRINCIPLES AND BERNOULLI'S THEOREM

Learning the basics and the benefits of Archimedes principles and Bernoulli's theorem was definitely beneficial in designing the air boost technology and the flying car mechanism better. The contribution and impacts that these two principles have on the technologies are astonishing and impeccable. The technologies discussed in this research are designed by interpreting these technologies in bringing greater benefits to the society and the environment. I studied about both the principles from Wikipedia, Britannica and Quora, thinking about how much the principles actually apply in our day-to-day life is fascinating. After researching on the Bernoulli's theorem and Archimedes principle, it not only made my technologies more practical and efficient to function but also increased my knowledge in analyzing how the principle applies into certain action.

THERMAL ENERGY CONVERSION

While the concept and idea of electrical conductivity to charge batteries from the atmospheric heat and warmth was in me, doing sufficient research in developing the thermal energy conversion became essential. It not just clears the atmospheric damages caused by manmade pollution but also makes an effective, practical and functional upgrade for electric engine, making it the strongest and potential technology. I researched multiple websites to get a better understanding on what is being used in the construction of thermal electric device and in knowing how the device actually works. These were from Wikipedia, Quora, and MIT News. These websites helped me gain a better understanding of how thermal energy conversion technology would work and how to make it work efficiently.

ROBOTICS

To write the evolution in technology and robotics, I referred to Universal Robots' paper called the industry 5.0. It discussed on technological developments that the industry has seen and the developments that is expected in the near future. We are now at a point, where technology and robotic automation are taking over the more mechanical strenuous works like building automobiles, painting an automobile, doing inspection work post-production, and even we are ready to trust the technology to drive us around. Automation is the development also seen in the

automobile industry, even the present automobiles offer multiple assistance features and replaces multiple mechanical components in an automobile to reduce the strain and stress, that increase the comfort and convenience aspect of the automobile.

These are the acknowledgments that I wished to make. Some of the other honorable mentions would be YouTube channels like the ‘car throttle’ and ‘learn engineering’. These are the websites that I searched to do my research for the thesis. These websites definitely came in clutch in redesigning and writing about the technologies and other chapters in the book.

PREFACE

Automobile architecture research was originated with the thought of my first technology, the air boost technology, which later on lead to other technologies like the flying car mechanism, anti-fire technology, dual engine, thermal energy conversion, and gearless transmission. All the following technologies were designed to resolve the issues that I came across on news articles online in automobile research websites. The technologies were posted as concept papers independently, this thesis expands it in detail along with discussing its need and prospects.

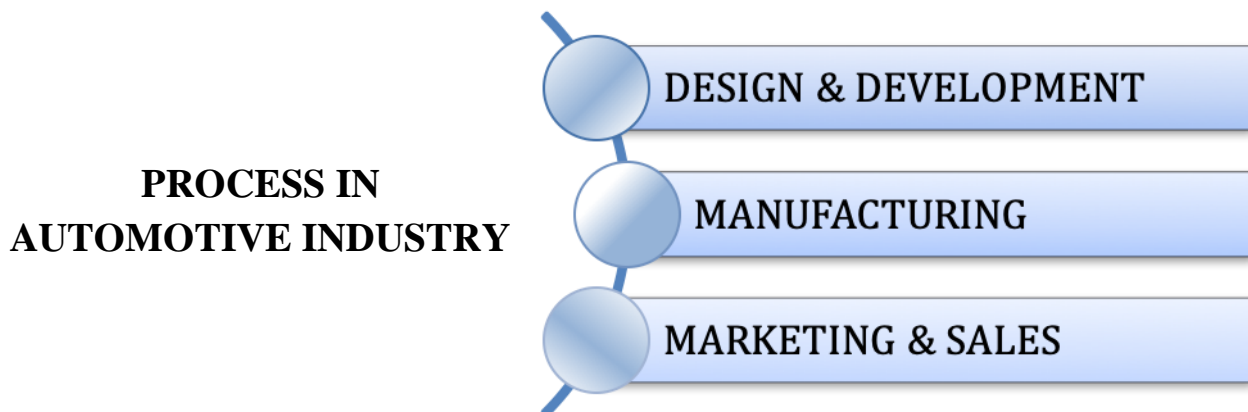
These technologies could revolutionize automobiles and evolve them to be better, versatile, practical and capable. That’s where the thought for automobile architecture sparked. Once the technologies were kept as the core value for this book, I decided to added further back story about automobiles from where it all originated from to where it’s at the present, and the problems we face because of automobiles and the possible predicted issues that can rise due to them, what automobile manufacturers and government is planning for the automobiles future, and what it can be with a conclusion, to create a flow to the readers and helps understand the issues and the technology’s capabilities better. This is how automobile architecture book came along, and how the ideas were brought into the research fittingly. Automobile architecture’s moral is to make automobiles evolve for the better, and serve for a bigger and better cause.

CHAPTER I - INTRODUCTION

Movement is the basis of life. The need for transportation evolved during the period of civilization when people settled in a place and learned to make products out of natural resources available in their region. Trade and exploration were the initial means for the transportation to emerge.

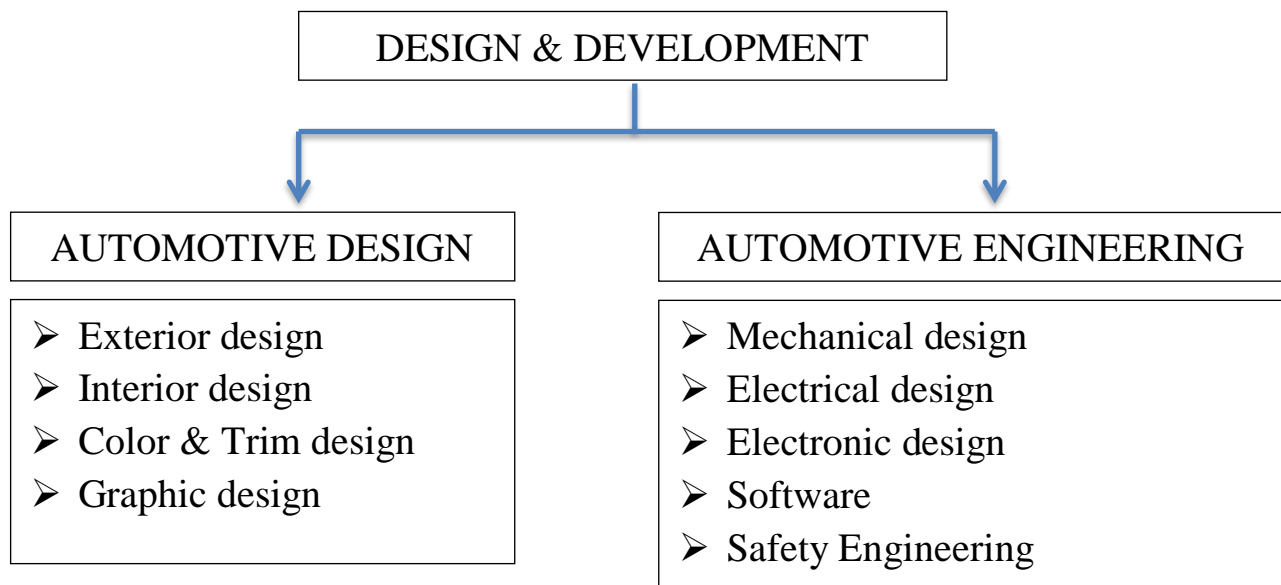
1.1 AUTOMOTIVE INDUSTRY:

Automotive had its origin when the steam powered wheeled vehicles were introduced in place of carriages for transport purpose. In the initial stages, transportation was human powered, muscle power of human helped them to move from one place to another and as people evolved, their means of transportation evolved with them. Automotive industry came into existence when privatization of self-powered vehicles was enabled, leading to mass production of various types of automobiles. Automotive industry is a unit that involves in design, development, manufacturing, marketing and selling of motor vehicles. Having known that the steps involved for an automobile to manufacture, let's now see the process in detail.



DESIGN AND DEVELOPMENT:

Automotive design and automotive engineering are the two key components of the design and development segment.



As the name suggests, exterior designing takes care of the exterior design of the vehicle with respect to shape, proportions and surface, while the interior designing takes care of the proportion, shape, placement, and surfaces of the interiors such as the instrument panel, seats, door trim, panels, headliners, pillar trims and other ensuring the ergonomics and comfort of the users. The designs would then be developed into digital and clay model for analysis and testing. Automotive design sector are responsible for these areas of work. Whereas, the automotive engineering sector relates to the safety aspects, fuel economy/emissions, NVH (Noise, Vibration and harshness), vehicle electronics, performance, shift quality, durability/corrosion and drivability. Automotive engineers design and tune the existing framework of the automobile with modifications and add-ons that better the efficiency and effectiveness of the vehicle and its use.

Aerodynamics design, engine upgrades, features like ABS (Anti-brake system), EBD (Electronic Brake Distribution), air bags, feather touch infotainment, etc. are some of the areas concentrated by the researchers of design and development division of the automotive industry, whilst the process, the mechanism and the skeleton derived for the functioning of automobile is kept untouched. Fixing the derived structure and mechanism as a basic constraint, researches in automotive industry are focused towards bringing in efficiency and effectiveness to the product by adding and modifying the components that goes into it.

This research dissertation on automobile architecture is to fill that void existing in the automotive industry from a design and architecture aspect.

1.2 WHAT IS AUTOMOBILE ARCHITECTURE?

Automobile architecture in the present is looked upon as designing the outlook or the exterior of the automobile that gives the vehicle, efficiency in its plight along with enabling fuel efficiency and a captivating look. While, architecture is not just that, architecture is the entire planning and designing of the automobile unit that eases the complication in its use and adds up to its efficient use without causing any problem to the user and environment. Automobile architecture research takes automobiles produced in the present with issues faced in the world and industry due to its use and showcases an apt solution emphasizing the concept of individualized personalization, which helps produce purposeful automobiles for the future and orient the thought process back to purpose and productivity of a product from fantasy and complexities.

With I4 (Industry 4) taking its place, industries are automated where the entire process is mechanized enabling rapid mass production. Industry 4.0 in its course will bring about monotony that any standardized industrial production line would face with, demanding the evolution of next phase, which is the personalized production. As the exhaustive part of the assembly and production line job are now mechanized through I4, it would be easy for the industry to enable its customer with personalized automobile suiting for their needs and comforts without imposing them to choose from a limited standardized design.

Automobile architecture is a conceptual research that suggests a full-fledged alternative design that enables the industry to take up the scope of personalization as a whole than restricting personalization to be within the color-options and additional features. Thus, automobile architecture is an excellence as distribution of energy to balance that the vehicle personalization as user defined and helps to find a solution for the issues found in the environment caused by automobiles through modifications.

1.3 IMPORTANCE OF AUTOMOBILE ARCHITECTURE:

Automobile Architecture is important because it takes on the issues found in the environment caused by automobiles and help in resolving the same with new advanced technologies rather than defining it to be a constraint and optimal. Automobile architecture works mostly endogenous, intrinsic that draws majority support readily for the creativity and ease it produces making it effortless and progressive for immediate adoption.

Automobile architecture helps finding new concepts that are innovative and effective, helping in upgrading the automobile industry, purposefully, which is now fantasy oriented with short living feather touch options, speech recognition, etc. that the variants show minimal difference on upgrades.

As automobile architecture helps in production of user defined automobiles that are personalized for individual specific needs and requirements, it will scope the user to stick with that particular automobile for a considerable duration enabling value for the economic and material resource invested in its production and purchase. This would reduce frequent switchovers of vehicles opted by the users enabling use of a manufactured vehicle to its possible lifetime.

Automobile Architecture also discusses on the flaws and problems faced in the world caused by automobiles like fuel cost, cost of production, cause of pollution, enhancement of comfort and sophistication, ease of plight and more. It discusses on vehicle design and architecture and helps with the evolution of automobiles and the industry. And these make the automobile architecture important and inherent beyond ultimatum to give continuum as progressive that would otherwise break and lead to fantasy as ever.

The verdict of automobile architecture is to evolve automobiles and upgrade their functionality and enhance their versatility, giving wide scope and applications to software in this field too.

1.4 WHY THIS RESEARCH:

This research initially started with my first concept called the air boost technology, watching the car manufacturers concept models and technology developments for the future, fuel scarcity and government's strict norms towards vehicle standards in emissions and safety. With problems on one side and government measures & demands on other side, research works of the automobile industry looked to be superficial that approaches in addressing the concern by surface oriented that don't address the core or neither resolves the problem but just enables interim solutions.

Due to the problems faced like modestly built cars that risks consumers life, pollution that causes environmental damage, population of cars that causes traffic and fuel inefficient cars that causes lot of fuel consumption leading to fuel scarcity, Governments and other regulatory agencies are on talks that pollution needs to be charged and that subsidies on fossil fuels be cut. Talks are also being made that building of coal plants be stopped by 2020.

Car manufacturers are moving towards electric cars and hybrid assisted cars to reduce fuel consumption and pollution.

While industry is on its switch to electric cars, there are problems arising around it too. Like child labor and safety issues pertaining to mining done for sourcing the raw materials needed to make batteries, inability of battery powered vehicles to support long distant transit, requirement of charging stations considering the time span and frequency needed to charge the batteries, etc.

As a part of climate action initiative, use of primitive and no-emission transportation means like, bicycles and going on foot is being suggested, promoted and popularized amongst the public. Giving up on something that's accomplished as development is pulling back the progress made. Isn't there any alternative that would help us in resolving all of these without any compromise?

The passion I have for cars and the automobile industry, made me to think of solutions for the problems that are confined as the constraints in the present pertaining to the industry that lead

me towards creating multiple technologies in reducing driving complications and solve the rising issues in the industry, which will be discussed later on in this book. The core of this book is to take air boost technology and other researches as a replacement for the gasoline powered motors and in being an efficient secondary power train to support a gasoline powered internal combustion engine. As the car manufacturers predict the future automobile to be powered by electricity, I feel like the air boost technology can be a genuine replacement for the hybrid and plug in hybrid power train. Serving the same purpose that of the hybrid power trains, air boost technology is more of a simple and purpose oriented design. The air boost technology concept is capable of powering a vehicle to move, at the same time it can be used as a secondary assisting power train for a gasoline powered internal combustion engine, which will be explained in detail later.

Multiple concepts which help solving the common issues faced in current scenario of automobile industry to reform it to next generic version are dealt in this book to give scope and it will further with time that assures progressive sustainability of the automobile industry. Thus this research help the automobile industry solve the common issues and upgrade the technologies and power trains used in the present too, when it has vista to get transformed superbly ultra high veteran designs that could evolve the automobiles with minimal or no manual control at all.

The book also discusses on the viability of personalized vehicles, where consumers are allowed to choose between colors, features, engine and transmission options with the model they prefer, enhancing the uniqueness and rarity of each vehicle found on the road. Automobile architecture, as the futuristic arena put forth in this research, further discusses on the technologies and concepts that were created by me as core technologies that abbreviate the functionality and benefits that can impact the society and the automobile industry from a design and architecture perspective. Architecture is fine-tuning in the personalized mode that adds to efficacy with no further cost, mostly at a lower cost. The benefit derived is remarkable that it won't inflate the market, but profit purposefully equating or excelling the inflation. The technologies explained in the book latter are redesigned from just being a concept design to be practical and functional in real world circumstances, and the scientific concepts like the Archimedes principle, Buoyant

force and Pushpak Viman helped in understanding the relevance of nature with technologies and redesign them better, flawless and progressive.

The technologies, I put forth are explained briefly with diagrams on how the implementation of my technologies would appear in an automobile, from an design and architecture perspective as these technologies proving feasible, science and engineering is left to be configured by the R&D department of the concerns that are adopting the technologies, as every automobile is different from one another and the purpose of designing an automobile can influence in configuring and specifying the technology.

CHAPTER II - PRESENT SCENARIO IN AUTOMOBILE INDUSTRY

Automobile industry now is focused more towards making environmental friendly, safer and balanced cars, with the increasing vehicle population, fuel shortage, and pollution, car manufacturers are downsizing engine displacement and cylinder, adding a “*supercharger*” or a “*turbocharger*” to support the downsized engine that makes similar or rather better performance out of the vehicles.

Sports cars started receiving a new downsized V6 and V4 engines replacing the naturally aspirated high displacement V8's, like *Old E90 BMW M3's* which used to be powered by a naturally aspirated 4.0L V8 engine capable of producing 420Hp of power the car redlining at 8400RPM comparing it with the facelift *2013 F80 model of BMW M3* which got a new replacement engine which was downsized to 3.0L twin turbocharged inline V6 petrol engine producing 425Hp redlining at 7500RPM, this 3.0L V6 turbocharged engine recently got an update in 2017 to produce 444Hp. By adding a turbocharger and supercharger to a low displacement engine, carmakers have started to make better power than the naturally aspirated motors. The core function of an engine through its criteria are improvised from basics to serve better as one unit assembled again, like increase in horsepower, reduction in RPM band, addition of turbo charger and reduction in displacement.

While automakers are downsizing the engines of their vehicles, Tesla introduced model *S P100D*, which achieved the second place of being the fastest accelerating car in the world right behind the Porsche 918 Spyder. With the amount of performance the car had to offer with it being powered by an all electric motor, having a great battery range, being environmentally friendly and yet being versatile, Tesla grabbed the attention of not only the consumers who are a regular commuters but also of the automobile enthusiasts, that the electric vehicle sales saw a growth. Tesla opened new dimensions in terms of technology advancement within the automobile industry by bringing in a lot of automation in their cars.

Cars are receiving more of an efficient downsized engine that are assisted with turbochargers and electric hybrid systems to recompense the power loss due to downscaling of the engine, to make them potent of performing as good as its predecessors, yet emitting less pollution, lessening the overall pollution rate, making them ecologically friendly. As the government is focusing more towards consumers' safety and emission standards, the norms are made sternly to be followed by the manufacturers.

As a result, even the entry level cars are produced with multiple safety features as standard, like speed assist warning, ABS and Dual Airbag Standard. It is also true that the blind safety initiative made the norms to stringent, drifting it much from the purpose that the technologies got deviated from purpose to satisfying the control agencies which eventuated to complete draw out demanding total reformation right from basics.

Manufacturers have begun to build their cars using light weight, high strength materials like heavy tensile steel and aluminum, which helps in carving the material to the cars aerodynamic design, and helps the vehicle return high mileage due to lightweight material. Computerized driver assistance programs are being introduced into vehicles like automatic braking, lane keep assist, blind spot warning and advanced traction control to assist in the driving control of the user that in case of a distraction, the system automatically takes control of the car. Though, as said earlier all safety measures are on, there need to be basic needs as to how the journey could be planned, pacing it to be comfortable and easy to traverse. It is all in the mind

set as how the journey is perceived, justified and hold on progressively a complete compliment for self and others.

Manufacturers have also started concluding production of their diesel powered internal combustion engines with the plan of introducing plug-in hybrid motors on their entry-level models. With some manufacturers already having entry level models with hybrid assisted gasoline engines on sale, the transition from internal combustion engine cars to hybrid electric cars is being done for the goodness of ecosystem, but the problems will arise as the plug-in hybrid cars will need electricity to power the vehicle, when mainstream of vehicles are changed into electric, there might be a scarcity for electricity like what happened as limitation with the internal combustion engine. This gives way for thermal heat conversion charging the batteries to run the car and an added duo engine with air boost technology to remain as standby all time. Both these being core can be added to petrol or diesel engine which could eventually go obsolete when the engine lapses its life span. The choice makes the trajectory pleasant and gliding traction, expecting the norms set forth as ten meters in between as not a stipulation, but normal. When you get into this perception, you won't feel like going nearer to other vehicles and a compulsion too will not be there even in towns and congested part of the cities. There will be human automation as mind set to be away by ten meters yet not stagnated, lagging in pace. When there is difference between expected speed by mind and reality, havocs arise, when you realize the car is ever with expected speed, you will not be forced to accelerate inadvertently anyways.

A driving satisfaction offered by an internal combustion engine cannot be fulfilled by the hybrid electric motors. It could also be viewed as driving has become a passion, light motif, from it being a heavy task managed through skills and managing the system altogether that light weight alternatives get accepted readily. Expense in maintenance and reliability concerns are relatively high on a electric powered motor compared to an internal combustion motor, the practicality on the long run daily usage in charging the vehicles every day, taking the car on a road trip having the need to charge, time for a battery to charge 100% compared to a fuel sourced internal combustion motor is high. The electric powered motor does have its fair share of positives, but it does have to face the practical complications in day to day life usage for the mindset of people need to shift from internal combustion engine to electric powered, taking it to

be linear vested with the comfort of the owning people, which turns every travel to be passionate with the advancement of a car providing more comfort, solidarity and solitude than just serving as a transportation media. The disadvantages said here with electric motors could be waived, if you find electricity is not from a charged battery but flows continuously as fuel from a thermal heat reserve that keeps tapping heat from atmosphere through heat absorbers otherwise that it runs simply better than the internal combustion engines where too the stopping for fuel break is warranted.

The next advancement that the automobile industry is heading towards ever is safety, and the cars in the recent days are getting lighter yet safer, car manufacturers are bringing in new ways of designs for the car's chassis which brings solid body structure for the car, increasing its competence to handle heavy impacts. Multiple placements of airbags in the interiors help the passengers not get hurt during a collision. Dual front airbags are made standard even in an entry-level segment to meet with the crash test norms and standards. ABS braking system with EBD is being standardized to ensure that the driver could potentially avoid an accident. When it comes to material, it is better to have polymer sheets than metals as the hit in case of accidents make them fall apart, not collide and drag with each other severing the damages. They come in brilliant colours, scratch proof and dent proof that maintenance is easy. Polishing which takes concern and care strenuously, is avoided as these polymer sheets glow naturally for long and fibers make them strong in slender adding to the speed of the vehicle. The feel inside the car won't be hooded, that nature is felt as ambience making the travel more delightful. The cars that are equipped with panoramic roof is for this. When magnets are used for brakes, there is no need for protection against accidental events as air bags and all. Rate of acceleration must be the same as rate of deceleration which is facilitated by differential gears and is no longer an add-on feature, but basic.

2.1 WHAT IS ABS AND EBD?

ABS (Anti-Lock Braking System) is a safety feature invented to prevent the front wheels from locking up in an intense panic braking, it helps the car to swerve out of the way while braking, which in many cases proven to have prevented a car crash. ABS was a safety feature

that was only offered in the top of the line trim in the late 2000's, but due to the strict rules and regulations towards the consumer safety by the road transport ministry, the feature was made standard across all trim lines. EBD (Electronic Brake-Force Distribution) is a sub-system that supports ABS, providing enhanced braking control for the driver to steer the car out of a crash situation with confidence and control. ABS make sure that the wheels doesn't lock-up in a panic braking EBD make sure that the car stops faster compared to a car that isn't equipped with one. Tagged on to the driving part is right, the way in which the driving is passionately perceived at guaranteeing the souls of all involved is risked at for which there are more additions to automobile research adding to the cost too where the purpose is nil. When the braking is designed to react for acceleration, the deceleration is normal even in an accidental even. The pressure is rightly transferred and is certainly not to each wheel, but to the entire system as a whole. Secondly, the braking is needed in a straight-line transit, The intervention as accidental event is transitional that the brake system need to be transitional, instantaneous to counter it. A magnetic brake system thus serves the purpose as integral part, not a featured sophistication as it is found now.

2.2 HOW ABS WORKS

ABS system helps the user of the car to have full control over the car during an intense braking situation. At a time of sudden braking, the front wheels would get locked up making it impossible for the vehicle to get steered off the path that could lead to a collision. The ABS system's intermittent intervention during the wheels locking up situation, relieves the brake pressure leading to the wheels rotate that allows the user to steer the car off the path. ABS determine its need of interventions through the speed sensors, during a panic braking situation it assesses as in whether it is one or more wheels that is trying to lock up and then reduces the braking pressure on that wheel, allowing the user to have a control over the steering accordingly that would prevent the car from skidding or colliding. A process can never be graphed point to point and reverses the same; it is to be viewed upon as holistic, natural to bring a natural process to counter it. Sensing is this, not certainly the calculations of numerals on assumed finites as myth thus a mare, risk ever.

2.3 HOW EBD WORKS

EBD is a sub system of ABS, it is a feature invented to support ABS by distributing the brake pressure to the appropriate wheel depending on the wheel traction, speed and loading of vehicle.

The EBD system makes sure that the brake pressure level is less in the rear end to avoid skidding during a panic-braking situation. It is because, mostly the car's maximum load lies at the front end due to engine. EBD system was invented to help the car stop quicker and to deliver maximum control to the user over the car even in a panic situation. EBD monitors all four wheels movement through the speed sensor and in a panic braking, the system dispenses braking pressure depending on the traction, speed and load on each wheels through the brake circuit, which helps the vehicle to stop quicker than a car that isn't equipped with this feature. In a magnetic system, without the troll of pressure, speed and all, all four wheels will come to sudden stop by magnetic pressure induced which is not calculated, but more to serve the sudden stop and abundance serves the perfect and timely, sharp instantaneous otherwise. The feel would be awesome, imposing no jerk to the system as a whole at all.

As the safety features were made standard, cars that are now made are tested to result in being safer than before. The government's focus toward safety and pollution standards is being set high, and manufacturers are moving towards a hybrid electric platform. As of now there isn't much of fully equipped electric vehicles on sale in India but as manufacturers are upgrading their power trains, by 2021 all electric motor powered vehicle is expected to be on sale, to meet with standards and criteria set by the government with regards to pollution and saving fuel.

Prices of diesel-powered vehicles are to be hiked, increasing the price difference between petrol to diesel variants of the same vehicle. This would increase preference for petrol versions over the diesel amongst the buyers. As the diesel power train sees a downfall, around the globe car manufacturers like Toyota, Honda and many others have already started producing their hybrid vehicles, where a electric powered motors are replacing the gasoline powered internal combustion motor.

While this would lead to manufactures discontinuing the production of diesel motor as of now, gradually the same would get extended to petrol motors too, at the end leading to an all electric motor vehicle. It is natural as all the crude, hard to extract fuel need to have a cease in all their applications, finding an alternate to cope up the regeneration rate assuring stability everyway. Volvo has planned to discontinue their diesel power plant with their future models, and have decided to introduce plug-in hybrid electric cars to the Indian market. India is one of the mass consumers of Volvo's diesel power train; nearly nine models in Volvo's line-up that is available in India are diesel. By 2019 Volvo is to bring in more of electric hybrid power train cars to the Indian market, within the next 3 years nearly four plug-in hybrid powered cars are expected to be launched in the Indian market by Volvo pacing out their diesel engines slowly. Air suspension, which the Volvo offers is in all of its automobiles, including busses. The air suspension feature increases comfort to the occupants yet increases a durability of suspension parts.





2.4 HOW AUTOMATIC EMERGENCY BRAKE SYSTEM WORKS

While every car manufacturer calls the system with distinctive names, the feature is commonly known as the automatic emergency braking system. It is a sensory system, which works with the help of the sensors, and camera located around the car and connected with the car's ECU (Engine Control Unit) system. At the situation, where the collision is about to occur, the system alerts the user by giving a warning sound or a vibration through the steering that the user would get alerted in paying attention and utilize the car's maximum braking capacity usefully to stop the car as soon as possible. If the situation gets critical and there's no human response made, the system takes control over the car's functioning to avoid the crash. Cars equipped with this feature proved to be 38% less likely to experience crash situation and as per analysis the system has also proven to have significantly reduced the impact and fatality caused by the crashes. In this place, magnetic brake system works integral. Without curbing the difficulty at the instance for purpose, and leaving it to pronounce to complexity and getting an absolute halt risking to 33% is following foot prints out of compulsion, taxing otherwise the purpose is served for concept by an integrated magnetic brake system progressively. A system, a technological advance is progressive and benefits are eternal while claiming it to be a best out of achievement, none other would do is waiting to be smashed, where furthering from a success into another is natural. The evolution as review supports this understanding his altogether. Inventions cannot be traded for innovations as legacy.

2.5 HOW ESC AND TRACTION CONTROL WORKS

ESC (Electronic Stability Control) is a feature that makes-sure that the car doesn't lose control due to over speeding. This system functions using multiple intelligent sensors that detects any loss of stability or control of the car and automatically brakes and controls car's throttle pressure level to every single wheel and brings the car back to control. This system assists the user with correcting the over steering or under steering that prevents the car from skidding, it enhances the cars handling on a gravel roads and improves vehicle traction on a slippery wet roads.

ABS and traction control are integral safety features of the ESC, cars that are equipped with ESC has ABS, EBD and traction control.

Traction control system optimizes the grip and stability of the car on road during acceleration by measuring the wheel rotation. Its reduces wheel spins by optimizing the engine power delivery and applies brake temporarily to that wheel which lacks traction allowing the car to have a smooth acceleration on a wet or snowy surface.

As air bladders used in suspension, that gives a swing and swivel to balance, the air boost technology used to form partition bladder that works under Bernoulli's theorem, considering air as fluid provides due cushioning that makes the car ply, not run which helps in long journey. The tyres of the wheel can be given a high air pressure that it gives natural stability and the vehicle can not slide how ever muddy the road is, used for off road transit, provided the material of tyres are strong enough to withstand the sharp edges. As they are nowadays made with elastic nature it is profoundly suited to take any shock loads with no vibration and damage at all. This era being collaborative for purpose and demanding no extraneous exponentiation, technology offers more and more of technical solutions to feel good being the manufacturers, meeting the demands of customers individual specific making the owner too feel proud on the investment.

2.6 HOW BLIND SPOT MONITORING SYSTEM WORKS

Blind spot monitoring system is one of the technologies made to enhance the consumer safety and convenience. The system functions through the sensors located at the rear corners mostly on taillights, they help the consumer to switch lanes easier. This system comes handy when a vehicle is approaching to overtake the vehicle from behind that could be the user's blind spot area. The system alerts the driver by an audible warning sound or a caution light, that there is a vehicle in the blind spot zone. This helps in the driver to switch lanes easier. It is again perceiving that the responsibility of overtaking vehicle alone would do to overtake that it is blind spot zone. Needless to say overtaking a number of vehicles in the front almost like changing the lane is legal, not talent. Certain things by practice are assumed to be big for the topics are general and to the imagination of people and overtaking is one such an illusion felt dangerous.

2.7 HOW LANE KEEP ASSIST WORKS

There are two different types of lane keep assist function, first type of function is by monitoring the lane rumble strips through the front camera, each car manufacturers use different warnings, some have audible warning sound, while other system sends a vibration to the steering simulating the feeling of running over the rumble strips, to make the driver aware of the car is in a danger of swerving into other lane.

Though the second type lane keep assist's objective is the same as the first one, the second system proactively takes control over the car to steer its way back into the lane, where the first type of lane keep assist relies on the user to make the corrective measure. This safety feature comes handy on a long travel when the driver is in fatigue, this helps in grabbing his attention avoiding a potential collision. Every action in a mobile scenario, there is a reaction, making it to response solidifies the functioning, avoiding complexities. In this way you accelerate to speed up and decelerate to stop. As it is said earlier, the entire technology is taking a shift that it goes real that one would expect phenomenal comfort and sophistication, easy to handle automobiles. When there is gearless transmission, you only take a linear motion that there is no fear of wheels to go offline anyways.

2.8 SPEED WARNING ALERT SYSTEM

Speed warning alert system is a safety technology that has been invented to reduce the overspending offence and reduces accidents caused due to over speeding. This system is to be made a mandatory safety feature in all cars sold in India by July 2019. Under this system, the safest top speed to be achieved in the Indian roads is set to be 120Kmph, the Global NCAP (National Car Assessment Programme) has suggested to create a safety feature which alerts the consumers exceeding the 120Kmph speed mark, with a continuous chime in the cabin for every 2 seconds, that would warn the user to slower their speed to be well within the set limit. Even though it is a frustrating feature, it is said to have been working for good cause. The placement of this feature into the automobile unit is said to be irremovable and built in a way that there wouldn't be any loophole to over ride the limitations of the control system. Speed warning alert system is not needed, when you enjoy your journey you will automatically regulate your speed and that is the foremost criteria to human control. Speed journey is not a fantasy; it is part of the facility where the road permits so.

Only vehicles like police patrol cars, ambulance and fire trucks, which have the license to be driven at higher speeds, are to have the exemption from this system. Massive consideration is the core reason for all accidental events, if you consider or give significance to self-responsibility, accidents do not happen at all. Yet there will be all the said activities as excellence of the system and competency of the person handling the car.

Ministry of Road Transport and Highways has stated that the nuisance value of the feature is what that makes it effective. It is by core vested on the orientation.

2.9 HOW SPEED WARNING SYSTEM WORKS

This system is programmed with the cars ECU by the manufacturer, the system keeps track on the car's speed through the speed sensors that displays the speed the car is been driven on the instrument cluster, when the car exceeds the speed of 80Kmph, the car will produce an audible chime twice every minute, but when the car crosses the speed limit of 120Kmph, the

system will continuously chime until the speed drops to be within the set limit of 80Kmph. The system cannot be deactivated manually or overdriven.

The speed management system is said to be helpful in reducing accidents caused due to speeding. Keeping the speed under this specified limit helps the vehicle in coming to a halt faster in a sudden braking situation and it also keeps the vehicle under control at all times, as high speed driving gives the driver less reaction time which causes fatal crashes. Anyways, this is one among the super care facilities, I would say.

2.10 AUTONOMOUS DRIVING

In 2014 Tesla Inc. introduced a feature called the '*auto pilot*', this feature allows the car to takeover the control to itself in navigating it's way to the destination point safely. Though it is said to be autonomous driving, the car still requires the user's help in steering functions. While an autonomous driving also known, as self-driving vehicles are driverless cars that doesn't need any manual control over it for its operation. Autonomous driving feature combines sensors, camera and software to control, drive and navigate the vehicle to the desired destination point. Until recent times, this concept was a mirage, there had been more and more of variants on this trials, yet it left lagged to fulfill aspects that rose in safety point of view. Artificial intelligence has provided solution for all these, it has enabled a full proof automation, which assures more than hundred percent outcome that these technologies are taking up a boom now to caravan, a mobile home altogether. The simple question that is going to change the automobile industry altogether, is whether you need speed or comfort; conviction is already there that you find more of SUV vehicles than the sleek models, variants of balance between the two promising personalized cars, the Industry 5.0.

Currently, fully autonomous driving cars are not legalized in the United States, though there are partially autonomous vehicles with varying amounts of self-automations from conventional cars with having brake assist and lane keep assistance to highly-independent and self driving prototypes. There need to be remote operations to share control from the driving person that the comfort zone altogether is to those in the travel. Days are not far away when the

whole driving unit too can be with feather touch remote options that would take away the steering completely.

2.11 HOW AUTONOMOUS DRIVING WORKS

Autonomous driving feature functions through multiple sensors and cameras which acts like a radar and detects the path while the system is connected to the GPS systems that helps the system in planning its path that sends instructions to the vehicle's actuators, which controls acceleration, steering and brakes. The System is programmed with a hard coded rules like obstacle avoidance, predictive modeling and smart object discrimination (which helps the system to find difference between a bicycle and a motorbike) and helps the software to follow traffic rules and navigate through obstacles.

While partially autonomous vehicles may require human intervention if the system encounters uncertainty, a fully autonomous vehicles may not even have steering wheel. When the traction is in direct control of wheels, there is no fear of wheels getting deviated anyways.

2.12 COMPONENTS IN THE AUTONOMOUS DRIVING SYSTEM

➤ **SENSORS** - **Sensors** are used to observe the surrounding of the vehicle for obstacles, which helps the system to understand the surroundings, main sensors in an autonomous driving cars are GPS/Navigation, cameras, LIDAR (Light detection and ranging) and Radars. Every sensor has its fair share of advantages and disadvantages, like the LIDAR is great at capturing information in various different types of lighting conditions. Whereas the cameras have a difficulty in handling certain occlusions caused by shadows or the poor lighting conditions. Most autonomous systems combines the reading from multiple sensory systems to add extra redundancy and compensate the weakness of the various sensors, which is a process, called as the sensor fusion.

➤ **V2X TECHNOLOGY** - **V2X Technology** contains two components called V2V and V2I, these components enable the autonomous vehicle to talk and receive back information from

other machine agents in the environment such as transmitted information from a traffic signal that it has turn green or conveying warnings from an oncoming vehicles.

- **ACTUATORS** - **Actuators** are the components of a machine that is responsible of controlling and moving the system. Actuators are used to bring the commands sent by the system to implementation by controlling the vehicles brakes, steering and accelerator.

The Hardware components of a autonomous driving system enables the car to function like communicate and move, the software is the brain, which processes information about the surrounding environment of the car so that it understands what action is needed to be taken whether to move, slow down, stop Etc.

2.13 SYSTEMS OF AUTONOMOUS VEHICLE SOFTWARE

Autonomous vehicle software can be categorized onto three systems: perception, planning and control.

- **PERCEPTION** – **Perception system** refers to the ability of the autonomous vehicle to understand information sent by the sensors and the V2V components. It enables the car to understand from a described picture whether a certain object is another car or a pedestrian.
- **PLANNING** – **Planning system** refers to the ability of the autonomous vehicle to make certain decisions. This is how the autonomous vehicle knows what to do in a situation whether to stop, slow or go. The Planning system works by the processed information sent by the sensors and V2X components about the environment with programmed policies and knowledge on how to navigate through the environment (do not run over a pedestrian, slow down at a stop sign etc.) which helps the car to determine on what action to take.
- **CONTROL** – **Control system** pertains to the process of converting the intentions and goals derived from the planning system and converting them into actions. Here the control system

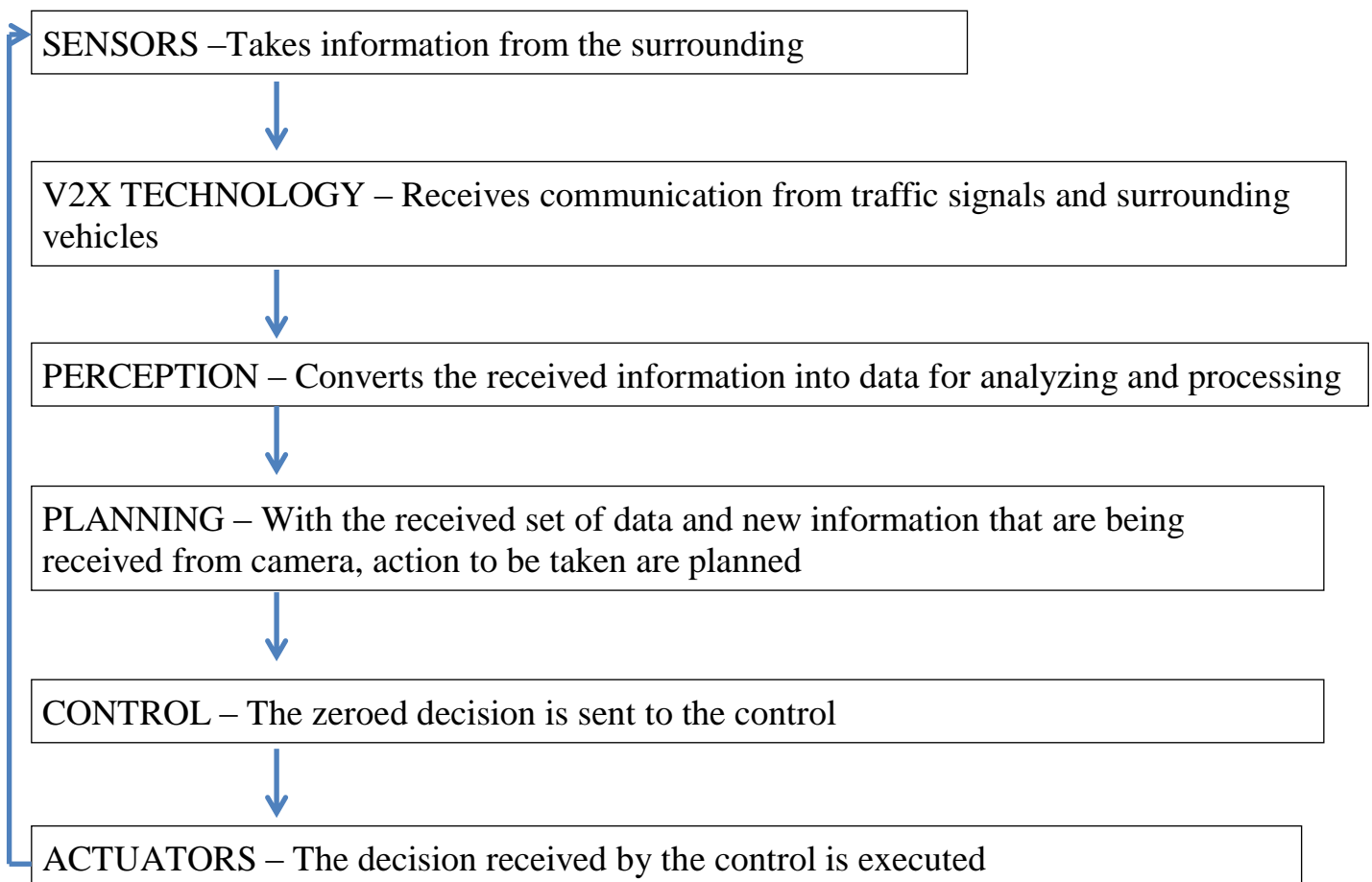
converts the commands sent by the planning system and conveys the necessary inputs to the actuators in actuating (enabling) the desired outputs

2.14 HOW THE COMPONENTS WORKS TOGETHER

Now that we have a better understanding over the components in the autonomous driving, Let's setup a scenario to see on how the components works together in a step by step process.

Scenario: The car has been stopped at a red light

Goal: The car needs to take an action when the light turns green without violating the road laws and considering the environmental factors.



- **Sensors** - The sensors take the information about the surrounding environment of the car, while at this point, the system doesn't consider this as information until it reaches the perception stage.
- **V2X Technology** - The traffic signal communicates with the car that the lights have turned green and the vehicles surrounding the car communicates their respective position with it through the V2X technology.
- **Perception** - In the perception stage the vehicle converts the information received from the sensors and convert into its actual meaning. The camera helps in further revealing the information that the lights have turned green and a pedestrian is crossing the street.
- **Planning** - The vehicle combines the sensor's processed information during the perception stage with the incoming information from the V2X technology determining on how to handle the situation. The cars policy is to move when the light turns green, at the same time, it also have an overriding policy that it should not run over a pedestrian. Here, now the car decides based on the environmental information and the programmed general policy on how to get operated and activated.
- **Control** - The car need to translate its decision to not move into an action, in this case the systems action is to stay still and keep the brakes applied.
- **Actuators** - Actuators keeps the brakes applied, which is the result of its decision making process stated above.

Having confirmed once again through this entire process when the V2X technology confirms the signal is green and the sensor confirms that there are none in the pedestrian with environment free to move, the actuators receiving the signals from the control initiates acceleration moving the vehicle towards its set destination.

This is how an autonomous driving system works. The system however still is being put under tests to make it an error free system to reduce the danger. The automobile industry is moving towards producing autonomous driving and eco friendly vehicles. There are complexities in the automobile industry, which will be discussed briefly in the upcoming chapter.

CHAPTER III - FUTURE OF AUTOMOBILE INDUSTRY

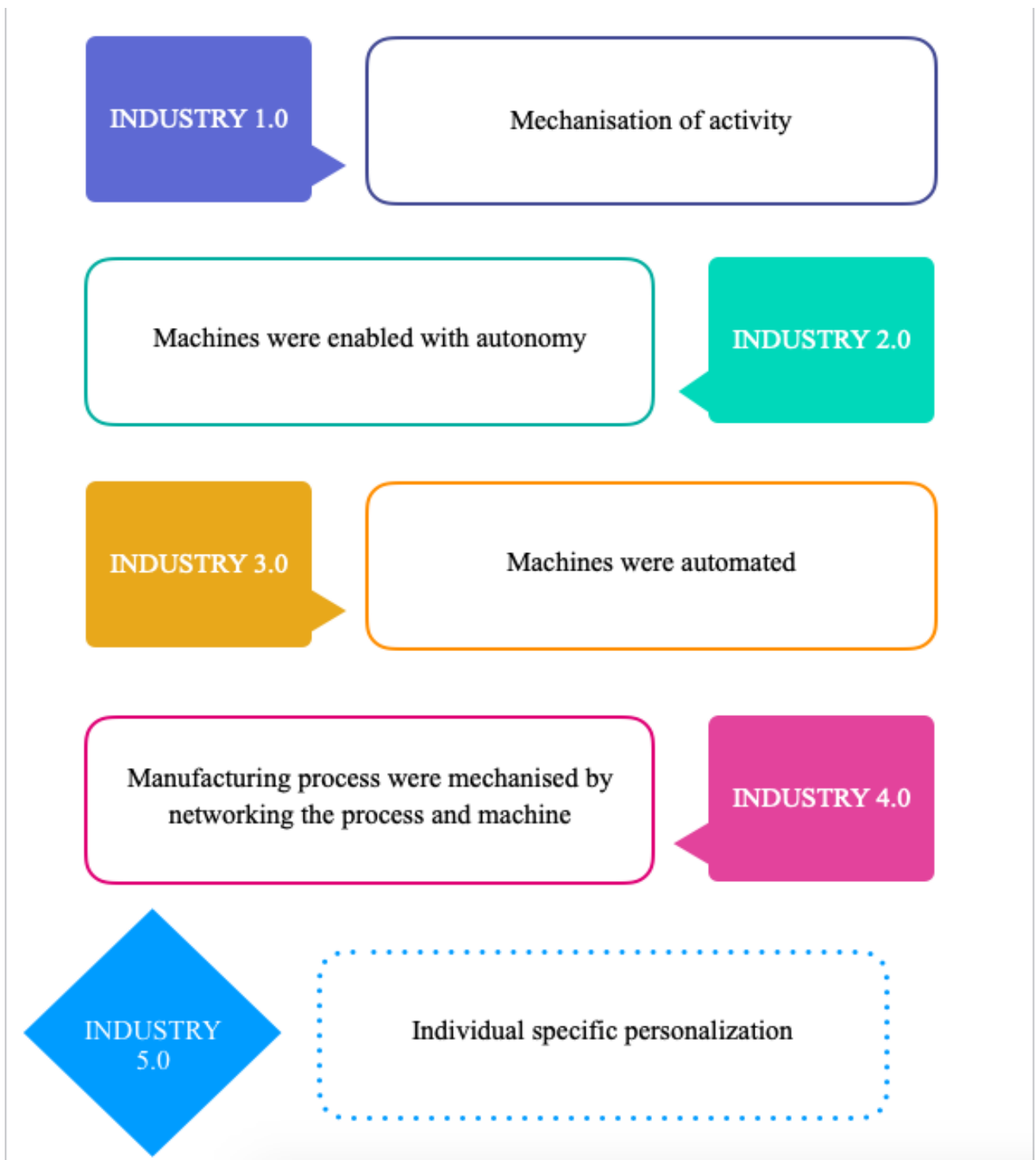
The future of automobile industry rests on resolving the environmental issues caused by the use of its products. Before discussing the solution, first let us take a look at the evolution of two things that would help us understand the need for implementing the technologies suggested, (i) Evolution of Industry and (ii) Evolution of automobiles.

3.1 EVOLUTION OF INDUSTRY

A superficial glance on the evolution of industrial revolution will help in solidifying the need in acknowledging the suggestion and solutions put forth in this research work. Learning the evolution in technology and robotics increases the possibilities and reminds that anything that can simplify the process and reduce mechanical energy can be brought to reality. Things that were originally done mechanically were automatized as we progressed through the years, to reduce effort and save up time. Learning the evolution in robotics and automation in the automobile industry helps to increase the possibility and strengthens my technologies better. And gives a better understanding on how robotics has influenced the automobile industry at present. The research towards the learning of robotics in the automobiles gives a better perspective on how a design that once was an imaginary concept can be brought to life, which gained my confidence that the technologies can be brought reality.

Industrial evolution is mostly known as industry indigenous, representing majority and each stage of evolution is numbered as 1.0, 2.0, 3.0, 4.0 and so on. We are to discuss now on

how the robotics has been infused into the industry. Automobiles that we have in use in the modern day are industry stage 4.0. Robots used at present are used to perfect the architecture of automobiles and perfect the design and vehicles architectural aspect. Robotics is not just used in an automobile but robotics also plays a huge part in design, manufacturing and assembling parts for automobiles.



3.1(a) INDUSTRY 1.0

Mechanization first originated when the use of machinery was made possible with water and steam energy. This led the world to upgrade itself to a comfortable working paradigm that helped in converting hard and large scale work to be carried out by machines rather than by human or animal. Industry 1.0 had its start back in the 18th century. It was introduced to reduce the strenuous work of the human kind, which would simultaneously enable speedy completion of work enabling the world to achieve more results in a considerably less time. Introduction of industry 1.0 came as an aid for the workers. Not just that, it also benefited the firms by doubling up the regular production capacity. Increase in production capabilities, resulted with noticeable growth in business. With the growth in business, it increased the job opportunities for the citizens of the country. This chain of the entire process resulted in overall growth enabling better lifestyle for people and a good economic growth. The demand of industry 1.0 had only one dimension, which is product volume. Industry 1.0 had environment of simple market where supplies were smaller than demands. It was during this phase of industrial revolution, human activities shifted its focus from agriculture and nature based works to industries. Steamship or the steam powered locomotive brought about massive changes because humans and goods could move great distance in fewer hours, expanding the reach, goods and materials had before it.

3.1(b) INDUSTRY 2.0

The start of industry 2.0 was witnessed at the end of 19th century with the introduction of electrical energy. Technological advancement such as electric energy, gasoline fuels paved way for the next level upgrade in the industrial sector. This upgrade enabled machineries to be powered by electricity, equipping machinery to be powered individually. Individually powered equipment means machines are portable. Further electrical energy proved to be better power producing source adding to the efficiency of the machinery thereby enhancing its output. The lag involved in generation of steam in the process of steam energy generation was met with the development electric power. Demand of Industry 2.0 had two dimensions, volume and variety. It was during this period, shortage of product supply (volume) were addressed by introducing assembly line and customer specific product design (variants) were brought as industrial supplies enabling diverse array of products for customers to choose.

Industry 2.0 was more about management, it focused on how to manage and bring about a balance between industry's supplies and society's demand. Assembly line came as answer than increased productivity by enabling division of labors, where each worker does a part of job of the total job. Along with increasing productivity, it also enabled increased efficiency and effectiveness to the manufacturing facilities. Therefore, the difference that existed with industry 1.0 between demand and supply was bridged by industry 2.0.

3.1(c) INDUSTRY 3.0

The advancements achieved by industry 2.0 with respects to its product and technology paved way for the next upgrade, industry 3.0. In late 20th century, with the advances in the electronic industry such as invention and manufacturing of electronic devices such as transistor, integrated circuit and on enabled the industries to get automated brining in the next phase, "industry 3.0". Automating individual machines resulted in reduced effort, increased speed and greater accuracy. It also reduced the need for dedicated machine operators. Automating machines demanded the need for software to program its functioning, this resulted in the origination and development of software industry. The software systems, along with being a program controller also acted as management supporter, by being an integrated system that supported enterprise resource planning, inventory management, shipping logistics, product flow scheduling and tracking throughout the factory. The process of automating industrial functioning resulted the price of industrial products to increase, as now, the cost of production that decides the product's unit price is not just the manufacturing cost but also the cost involved in automating the industry and its maintenance. In order to reduce the product's price and keep it affordable for the consumers to purchase, manufacturers were forced to move to low-cost countries that led to the formation of supply chain management concept.

It was during this phase of the industrial revolution, automobile manufacturing facilities and automobiles got better and efficient with electronics assistance and integration. ECU (Electronic Control Unit) was invented that enabled vehicle's tuning and optimization by reading values, interoperating data from other components of the vehicles. The software installed on the

assembling robots was much more improved and functional that it doubled the normal speed of work. This helped in increasing the manufacturing numbers and deliver the vehicles to customers at a faster pace. It also helped manufacturers to offer more options, in terms of colors in a particular model than before without affecting the production speed, which boosted the sales of automobiles and increased the personalization aspect of automobiles. Though it is nothing like what we have today in configuring an automobile online from home with a variety of options from colors, features, engines, transmission, and equipment, which are all the possibilities enabled by the industry 4.0 advancements, it still was a major leap from what was possible in the era of industry 2.0.

3.1(d) INDUSTRY 4.0

As discussed already in 3.0, the need for cost reduction forced manufacturers to move to a low-cost countries, this demanded connectivity between and sharing of works done at two different geographical locations that brought the use of Internet into the industry's functioning paving way for Industry 4.0. Internet enabled the possibility to merge the boundaries of the physical and virtual world resulting the paradigm in which manufacturing industry worked and traditional production operations worked to change. Introduction of CPSs (Cyber Physical Systems) allowed machines to communicate with each other with almost no physical or geographical barriers resulting in rapid technological advancements. Combination of Cyber Physical Systems, Internet of Things (IoT) and Internet of Systems made industry 4.0 possible bringing the concept of smart factory to reality.

As the systems are networked and connected together, machine's share information and data within and amongst them unlike the regular routine where individual's are expected to feed the input data for individual machines to function.

Networked systems helps in identifying the void, problem or loop in the process enabling manufacturing to be efficient and productive with less wastage. The networking of system keeps the supply chain in track that enables to alter and modify the production's routine and target accordingly. CPPs also allow an industry to be completely visualized, monitored and managed

virtually from a remote location, scoping to adapt the industry's functioning in such a way that their products could be priced nominally, which was the demand of industry 3.0.

3.1(e) THE FUTURE, INDUSTRY 5.0

The pattern of evolution taken, starts from mechanization at first, then evolves to autonomy, automation and networking where the next possibilities of evolution analyzing the trend is, personalization. Industry 1.0 mechanized activity by introducing machines that created need for improvised variants in Industry 2.0, likewise, industry 4.0 mechanizing the process would again go mechanical creating the need to fine tuning variants as alternates. Having increased idle manpower and reduced need for human intervention and human effort in the manufacturing process, bringing in individual specific customization is possible.

In Industry 5.0, the production mechanism would evolve from the assembly line pattern to standalone production pattern where machines will be individually full-fledged in producing the entire product on its own. With advancements in mechanisms that were achieved through the industry's evolution, now, the machines will be equipped in such a way that from the start to the end, individual machine will be capable of carrying out the entire production process on its own, where multiple individually functioning machines will enable the industry to accomplish mass production.

Now, how could machines be constructed or process be designed that would enable it to be equipped as a standalone unit? The answer is artificial intelligence. The entire process and customization factors will be integrated into the machine, inputs for the production will be fed in accordance with the personalization preference opted by the consumer. With the permutations and combinations attribute of AI, the machine will process the data with feed forward and back propagation process in finding out the process and features required for producing the product in accordance with personalization factors set for it and permute the sequencing of the manufacturing process and line of products required for its production.

Enabling individual machines to be full fledged on its own in carrying out the entire

production process required to manufacture a product helps the industry to overcome the temporary suspension of production process that would usually be caused if there occurs some failure or technical glitch in the assembly line machine.

With the networking facility introduced by industry 4.0, communication and co-ordination between the outlets and the manufacturing units with respect to accommodation and execution of the personalization request put forth by their customers individually is made easy and comfortable. With less human attention required in the supervision of production process, all of it could be diverted in facilitating consumers with individual specific products that would enable them own a product that is of absolute use to them without any complaints or unhappiness over a particular feature which otherwise would be forced to them if it is a product with standardized design and variations.

The study on evolution of industry and automation involved in automobiles manufacturing was a pleasant journey as we progressed through years, every version of the developed robotics and automation are made to speed up the process of work to double up the production capacity and automation technologies developed for automobiles have to create a blissful, convenient and sophisticated experience. This research further proves the point that everything has started from an imagination that was provoked to simplify, save time and increase the efficiency and convince of vehicles which have been brought to reality successfully. This study further strengthens my technologies and confirms that it can be brought to reality with its full functionality and efficiency.

3.2 EVOLUTION OF AUTOMOBILE:

Through the origin and evolution of automobiles, it could be observed that initially automobiles were steam-powered vehicles that later got evolved as electric and gasoline powered vehicles.

Evolution of cars to its various stages in detail from a basic steam powered to the current ICE (Internal Combustion Engine) can be found in the latter part of this dissertation under '*Review of Literature*' title.

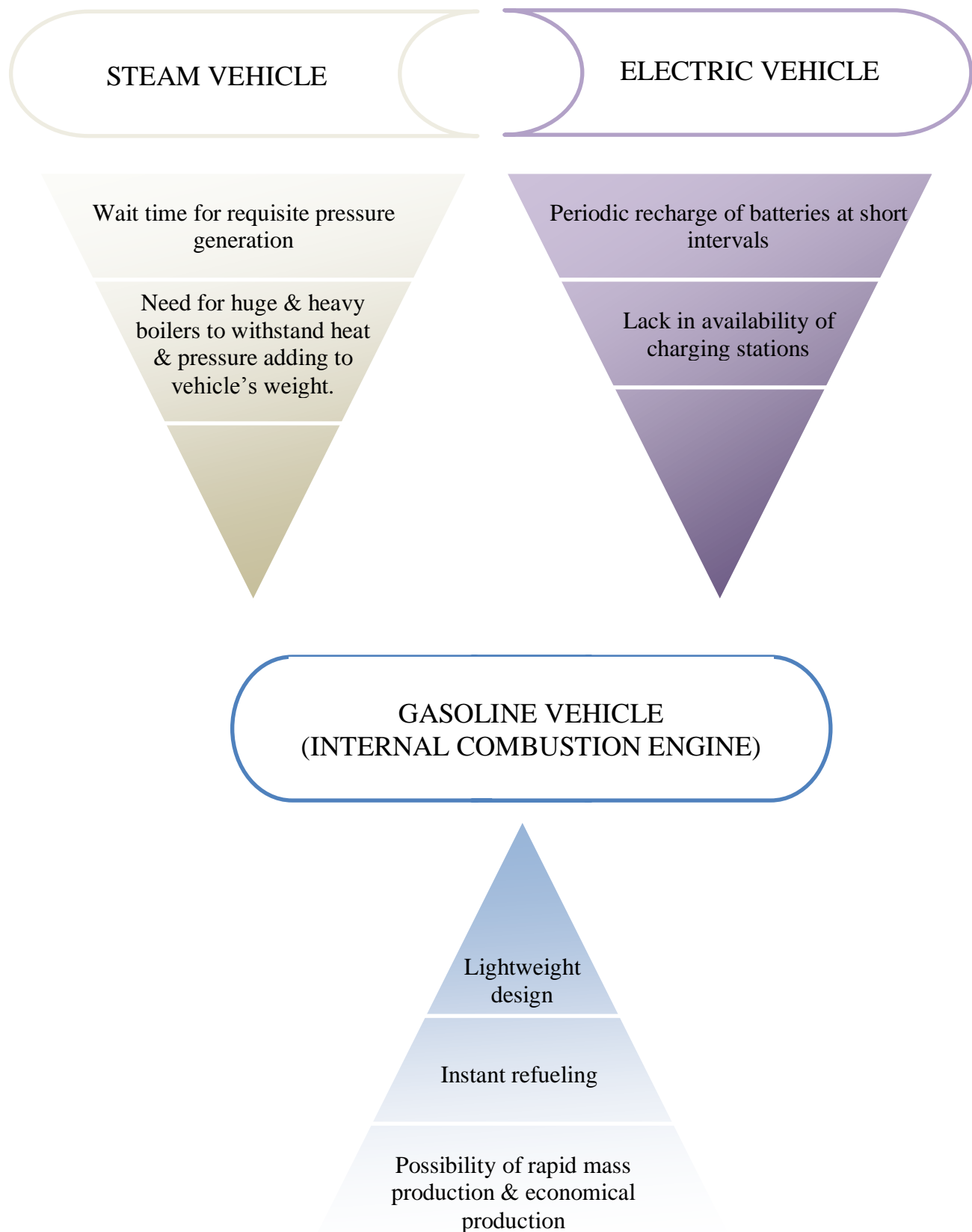
In a gist, at first, automobiles completely relied on steam engines for its functioning, researchers and inventors focused their building stable, reliable and efficient steam engines. Then came the electric motors, automobiles were powered electrically, researches in this period of time was on designing reliable and stable electric powered vehicles. Electric vehicles had an edge over the steam powered vehicle for it had lesser wait time in the production timeline and the World War scenario that persisted at that point of time imposed limited resources for the steam powered vehicles. In due course of time, electric vehicles had its own shortfall like frequent needs for charging the batteries, time taken for charging the batteries and lack of charging stations. These constrictions held back further works on electric vehicles giving way for gasoline-powered vehicles.

With gasoline and steam power-driven automobile at production, gasoline powered internal combustion engine took an edge over the steam powered vehicle as the Ford assembly line enabled rapid mass production that made steam carmakers to shift their vehicle as premium, luxury product on having accomplished automated driving, this again didn't workout as Ford's Model T that was six times cheaper than the most popular steam car of that time.

Since steam powered vehicles and electric vehicles had their own disadvantages and as ICEs proved to be economical, efficient and effective, the automobile industry majorly, and to an extent completely relied on internal combustion engine vehicles with petrol and diesel powered engines.

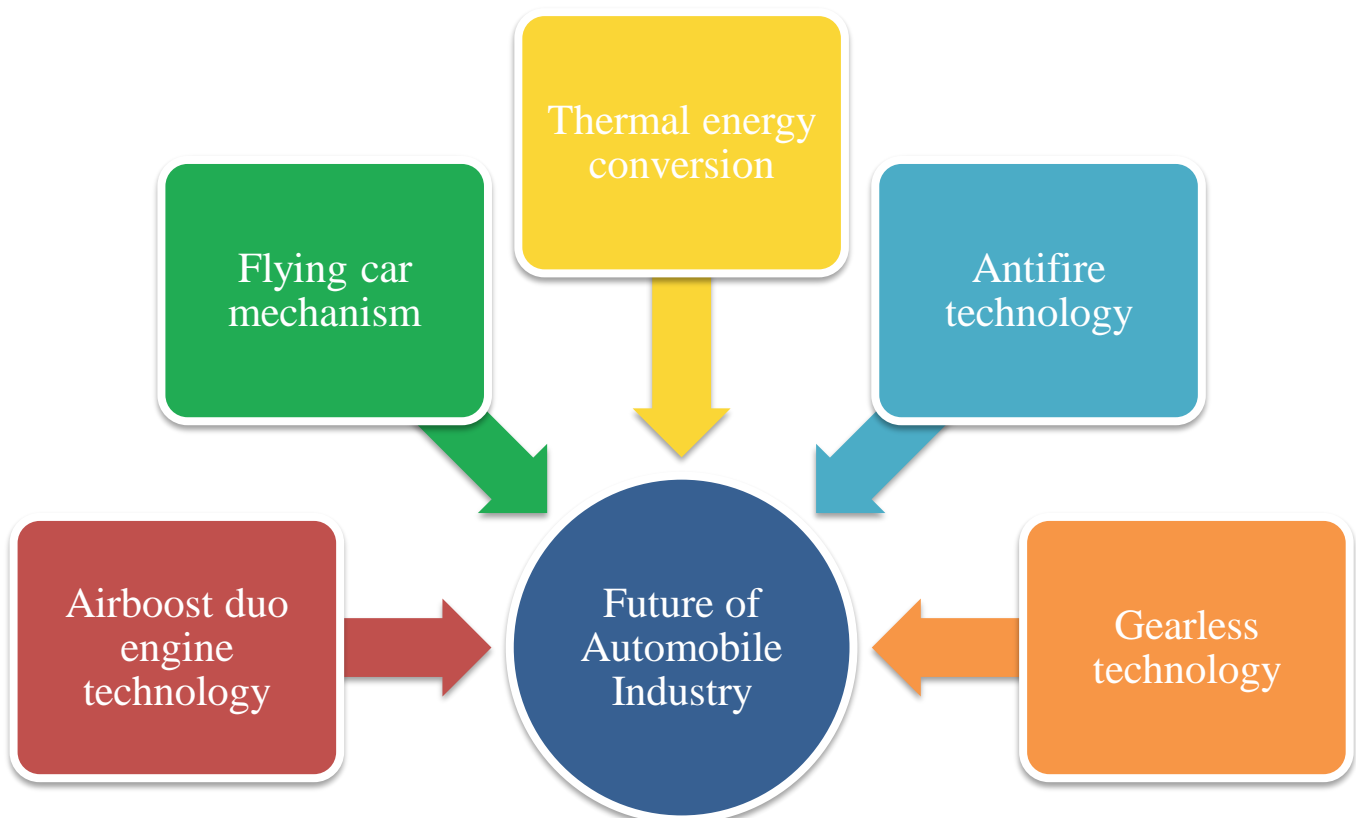
With gasoline powered internal combustion engine being in use for so many years, we see lot of problems arising out of its use as seen in the previous chapter like climate change, pollution, etc. On the other hand, we also see that the automobile industry is taking its focus back to electric vehicles. Through the evolution of automobiles, we did see that, every evolution taken by the industry had its own disadvantage. Problems until now had existed because of two

reasons; one is because of the shift took both in terms of mindset and manufacturing from purpose to fantasy, secondly, it is because of the environmental imbalance caused due to its reliance on non-renewable resources for its functioning that at the end point turns out to be a pollutant causing harm to environmental quality and balance.



The future of automobile industry rests in solving these issues surrounding the industry and in fixing it back to its purpose that would enable us with an automobile industry that is balanced and communally responsible. Taking back the gasoline-powered engine to electric powered vehicle isn't a perpetual solution as there already exists problem like energy deficiency, resource deficiency for materials needed for manufacturing of battery and mining issues. So, how could this be fixed? Lets discuss about it in detail, here in this chapter. This chapter discusses how the industry and the automobiles could evolve from where is it right now.

As we have discussed about the problems faced by the automobile industry at present, in the earlier chapter and as analyzed at where the automakers are planning to take the products of the industry by converting the internal combustion engines to electric motors, this chapter will discuss on how the automobiles can be taken forward from the present, by integrating technologies conceptualized through this research in making them eco friendly and solve the common issues found. This chapter will discuss more on why these technologies will help solve the issues and explaining why I designed the technologies. The special quality of these technologies is that, they can be implemented in any modes of transport, starting from motorcycles, cars to airplanes and ships.



There are 5 technologies, (i) air boost technology, duo-engine (ii) flying car mechanism, (iii) thermal energy conversion, (iv) anti-fire technology and (v) gearless technology. All these can be used in all modes of transportation and this chapter discussed on the "why", the next chapter will discuss on how it can practically be implemented in the automobiles and briefly discuss on how it functions and benefits of the design's implementation.

Main and more common problem in the automobile industry is the vehicle population and pollution. When it comes vehicle population, though there is nothing that can be done to the already existing population, with personalized automobiles of industry 5.0 concept, further increase in vehicle population can be brought under control, as here with personalization facility, customers can combine all the features and options available in one single car that alleviates the need for switching over between variants and models to own the upgrades, which is a problem in the current standardized design of variants. Even with personalization, automobiles can withheld its top position in the world's economy converting the quantitative value to qualitative value with which it can also take the pride of being the top economy along with it being responsible and eco-friendly.

Secondly, coming to pollution. When it comes to the pollution, the automobile manufacturer's R&D department are focused towards designing more aerodynamic body shells for the automobiles and in producing more eco friendly downsized engines with electric/hybrid motors for the vehicles to result in reduced pollution. The government is funding the automakers for their R&D on electric vehicles, it is also providing them with incentives and of exclusive offers for the electric powered and hybrid powered vehicles, in order to promote these variants amongst the buyers.

Researches have been made on electric cars for the futures, by the automakers to control the two prominent issues which are pollution and increasing fuel crisis in countries, but as already discussed, this isn't a perpetual solution ,like fuel crisis, we also have energy crises and various other forms of problem surrounding the use of electric vehicles, up next let me explain how the research finding of my technologies can help in resolving the issues with simple and

practical design that would be an everlasting solution, without affecting the fun to drive characteristics of a vehicle.

CHAPTER IV – TECHNOLOGIES TO SOLVE THE ISSUE

4.1 AIR BOOST TECHNOLOGY

Air boost technology is a concept that is designed to create a transformation and advancement in the ecosystem and to the automobile industry, the change for the better. The concept of air boost technology helps in resolving numerous different issues that the use of conventional automobiles has brought to this realm. This concept was originally designed to supersede the internal combustion engine of the automobiles that would be produced in the future, but as the research on the air boost technology went profound, I came across multiple thought processes, which are all explained here.

Air boost technology is a mechanism that encompasses air and air only, it intakes air, produces the necessary mechanical energy needed to generate momentum for the automobile's motion and purifies the air on exhaust.

This technology is being split into three phases;

- (i) Phase I: *Basic air boost technology* as an exclusive engine for automobiles.
- (ii) Phase II: Air boost technology as secondary engine for prevailing cars integrated under the concept of “*duo-engine*”.
- (iii) Phase III: *Advanced Air boost engine* with *Bernoulli's Principle*

4.1.1 AIR BOOST TECHNOLOGY – PHASE I – BASIC AIR BOOST ENGINE

‘Phase I’ of the air boost technology features the basic concept on how vehicles could be powered by air fundamentally using the air boost engine. In an traditional internal combustion

engine, the line of process is that, it intakes air into the combustion chamber where gasoline or fuel is sprayed, taking oxygen from the air, combining it with the fuel and the spark from the spark plug ignites the process of combustion which increases the pressure to move the piston, upon exhaust the vacuum created in the chamber results in positioning the piston back to its original position preparing it for the next combustion cycle. This travel of piston is called the stroke. Hence, a traditional internal combustion engine totally consists of four strokes, namely, (i) intake, (ii) compression, (iii) combustion and (iv) exhaust.

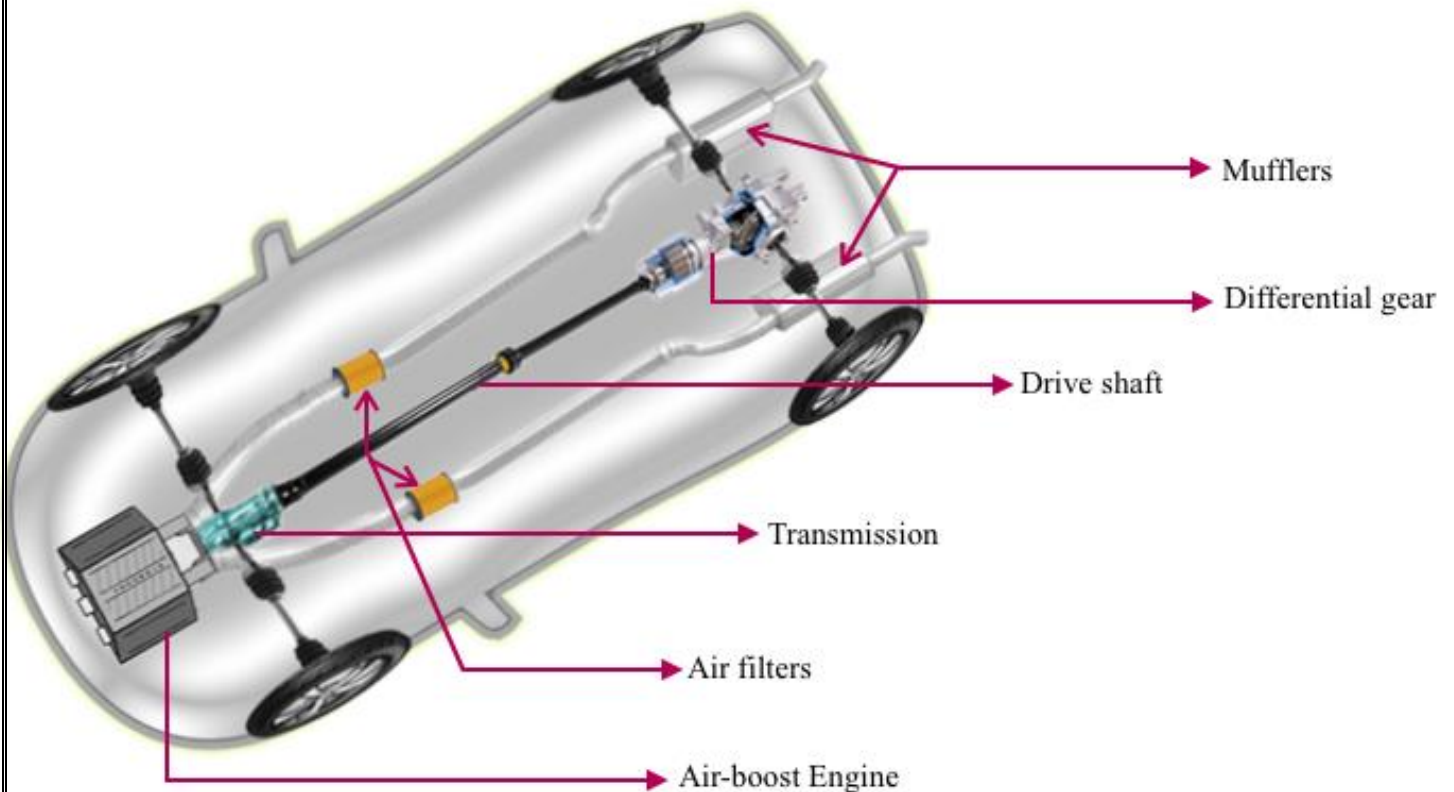
Whereas, in an air boost engine, the pressure generated for the vehicle's movement through combustion stroke that adds to the carbon foot prints is replaced with boosting technology that would generate the pressure for the vehicle's functioning by amplifying the air's pressure through the booster motor.

The phase I segment consists of air boost engine, the chassis, body, transmission, suspension and others of an automobile that is on offer at present.

STEP-BY-STEP

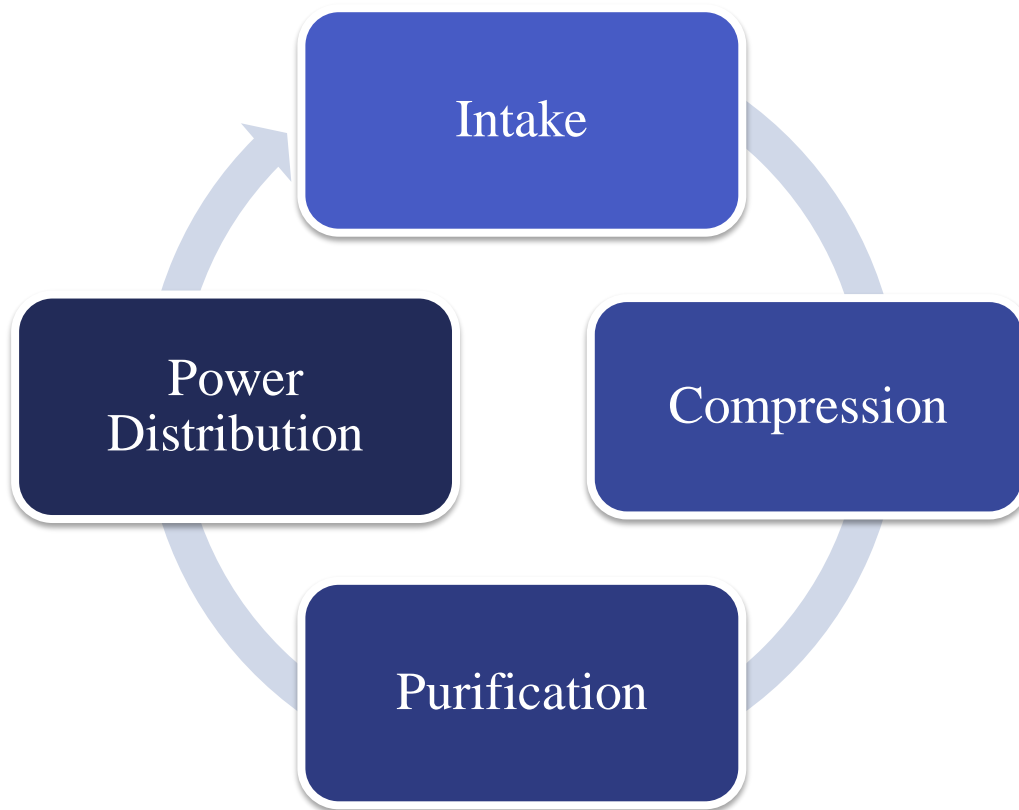
- ❖ Intakes air and purifies
- ❖ Enters the air boost motor through the throttle body
- ❖ Compresses the air
- ❖ Generates energy by revolving the propellers
- ❖ Compressed air flows through the second pair of propellers located beneath the first propellers
- ❖ Generated power transmitted to transmission

- ❖ Compressed air travels through air filter for purification and is exhausted
- ❖ Transmission sends the power to the differential gear via a driveshaft
- ❖ Differential gear distributes the power to the wheels



These are the step-by-step process of how an air boost engine functions. Now let's get to the topic of explaining how the engine functions briefly.

The air boost engine consists of 4 levels when it comes to power production and functionality, which are,

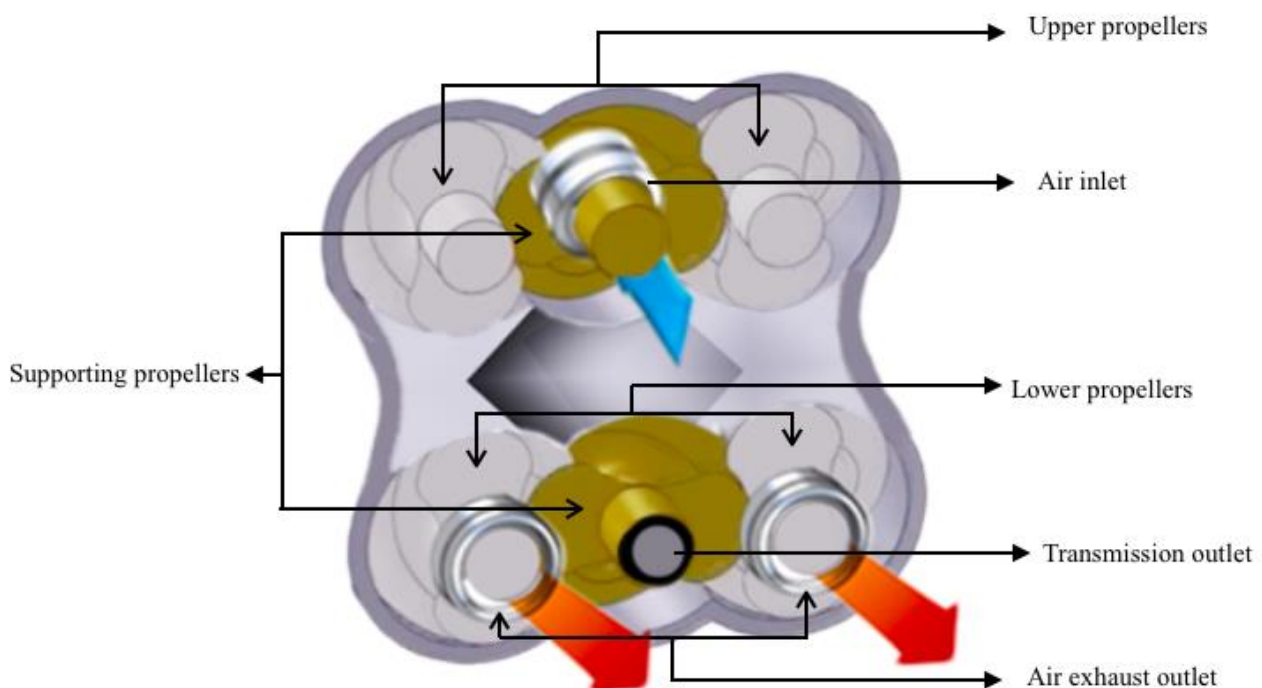


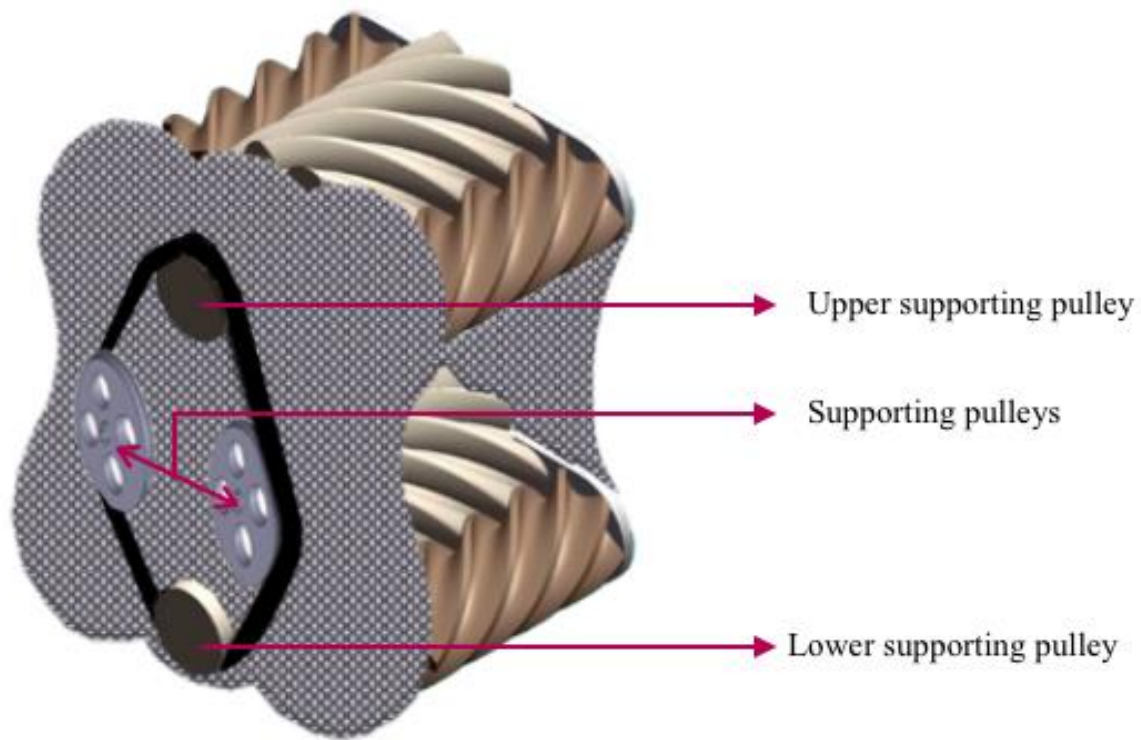
4.1.1(a) INTAKE:

Starting off with the first level, intake. The air to the air intake box is taken through the front grill. Once the air boost engine is switched on, the battery supplies power to the air boost motor. Upon applying the accelerator, the throttle body opens accordingly allowing the air to flow into the booster motor. The vacuum inside draws in air to the air intake box. The air taken in is then passed through purifiers where the dust particles, bugs, insects, etc. are filtered which otherwise could cause damage to the engine's and booster's functioning. The purified air then travels to the throttle body via air intake tube. The throttle body helps in regulating the airflow into the booster engine. The throttle body's functioning is controlled by the accelerator pedal, when force is applied on the accelerator pedal, the throttle body opens and when the pressure on the accelerator pedal is released, the throttle body closes, the volume of air flow depends on how much pressure is applied to the accelerator.

4.1.1(b) COMPRESSION:

The air boost motor contains a pair of propellers placed side to side in screw pattern. In total there are two pair of propellers, (i) the upper propellers and (ii) the lower propellers. In-between each pair of propellers is the supporting propellers. After filtration, when the air enters the air boost motor, the air is directed by the upper supporting propellers to flow through the upper propellers, which is responsible for the initial process of amplifying the air pressure through rotation that would convert the airflow into the needed mechanical energy. Having pressurized through the first set of propellers, the pressured air enters the second pair of propellers located below the first one, here, it forces them to spin again intensifying the generated energy to a level that would be sufficed for the vehicle's propulsion. Supporting propellers in-between the lower set of propellers directs the generated mechanical energy to the transmission. To enhance the energy generation and to enable both the set of propellers to function in harmony, each set of propellers is connected to a pulley with belt. Also, both the upper and lower supporting propellers are connected to this pulley system, the synchronized functioning of it intensifies the mechanical energy delivered by the lower supporting propellers to transmission. This pulley system further provides extra energy and support to the propellers, helping the propellers to spin at a faster pace that would result in generating more horsepower for the vehicle to run.





4.1.1(c) PURIFICATION:

The compressed air is then made to flow through a purification process, where the air flows through an air filtration system that helps in separating the toxic molecules and pollution particles from air, ensuring that the air exhausted back to the atmosphere is purified, toxic-free that doesn't contaminate the quality of air available for mankind to breathe. This process is one of the key notable points of the air boost technology as it not only uses air to generate power but it also purifies the air before exhaust which helps in cleansing the air and reduce the pollution issues in the ecosystem and help provide a healthy environment to the society and the next generations. Once the air is being purified, it exits the vehicle.

4.1.1(d) POWER DISTRIBUTION:

As the air exhaust, the mechanical power generated through the compression process gets transmitted to the transmission attached to the lower supporting propellers. Since Phase I is about incorporating air boost technology in the vehicles that is in existing production line, power distribution here is explained for the present construction of automobile.

The clutch balances and equates the speed of the engine and the speed of the wheel, while

the transmission regulates and distributes the mechanical power received according to the gear set through the shifter, creating torque. The gear within the transmission directs the power to the differential gear via the driveshaft. Depending upon the differential gear ratio, the required number of rotation taken by the driveshaft for every turn of the wheel is determined. From the differential gear, the power is distributed to the wheels via the half shaft enabling the vehicle to move.

This is how Phase I of the air boost technology functions, the next phase will discuss on how the air boost engine can be placed as an alternative upgrade in the existing automobile that is already in use. The phase I kit is for the immediate implementation for automobiles that is in the production line and how the air boost technology will work as the only power plant.

4.1.2 AIR BOOST TECHNOLOGY - PHASE II – DUO ENGINE CONCEPT

‘Phase II’ of the air boost technology features on how this technology can be implanted into an automobile that already exists with the conventional internal combustion engine. This helps individuals who own a traditional internal combustion engine vehicle to upgrade and have an alternative option for air boost engine. With this phase II option, user could avail air boost technology in their existing automobile while still having the internal combustion engine in its place, thus enabling phase II option to be “*duo-engine*”. User could choose between the engine options for their choice according to the desired driving experience using an engine drive mode selector switch.

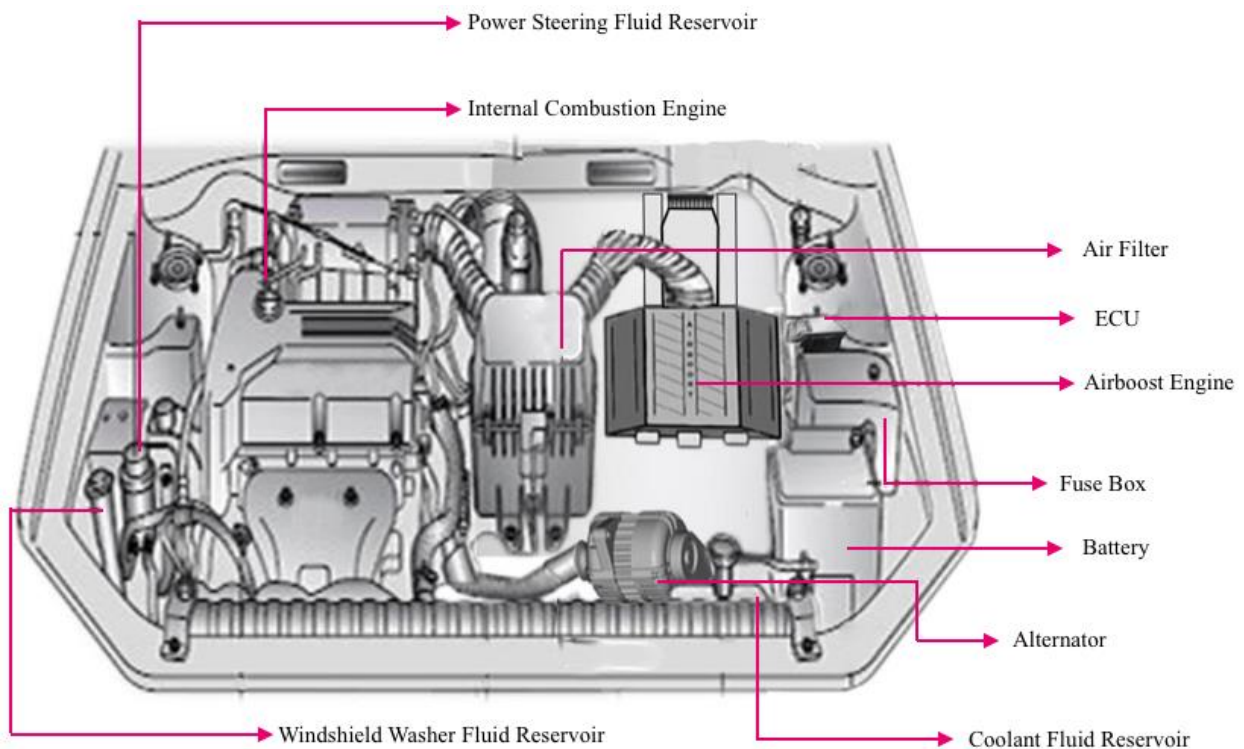
Duo-engine concept is where both the standard internal combustion engine line and air boost engine line will be available and the user could switch between the two for their preference according to their needed drive experience. In this duo engine concept both the standard internal combustion engine and air boost engine will be available side to side with simple interface that enables easy use, reducing clumsiness and complex functionality.

This phase two kit helps to transfigure millions of vehicle that are in function to be an ecological and efficient product. This further helps in controlling the increase in vehicle

population as it enables users to customize their existing vehicles.

Now, let me explain how the phase II of this technology functions.

Here, the air boost engine will be placed next to the already existing internal combustion engine. The engines functionality can be switched from one to another through the ***engine drive selector*** feature that would be provided in the vehicle's instrument cluster. The user can choose between the two according to their preference.



The power to start the internal combustion engine and the air boost engine is supplied through an ECU switchover found in the engine bay in-between the battery and the engines. Respective engine as per the selection made by the user in the drive mode selector cranks up and carries out the further procedures involved in driving of the vehicle.

Using the Phase II kit to upgrade the existing automobiles with air boost technology helps in maintaining the vehicle's value stabilizing the sale and balancing the vehicle's population. It also helps in tumbling the consumption of resources that would add up as scraps in recycling the

vehicles. Balanced usage of both the engine modes reduces the amount of pollution and global warming effects, which otherwise would be visible and prolific with internal combustion engine as the only option.

4.1.2(a) HOW PHASE II KIT FUNCTIONS:

- Firstly, the user needs to select the desired mode of drive using the drive mode selector,
- If internal combustion engine is selected, the ECU powers the internal combustion engine and the vehicle functions as usual.
- If the air boost engine is selected, the ECU powers the air boost engine. Here, the vehicle relies solely on air for it's functioning.
- At first, the engine, takes in air through an air intake system. The air is then purified ensuring that dust particles and other foreign particles in the air is filtered before it enters the boosting motor.
- After this purification process, the air enters the 'air boost motor' through the throttle body. The throttle body is attached to the accelerator pedal, depending on the pressure applied to the accelerator pedal, the throttle body opens and lets the air in for the compression process.
- In the compression process, the air gets compressed and pressured, to flow through the propellers inside the booster motor from where the power production begins.

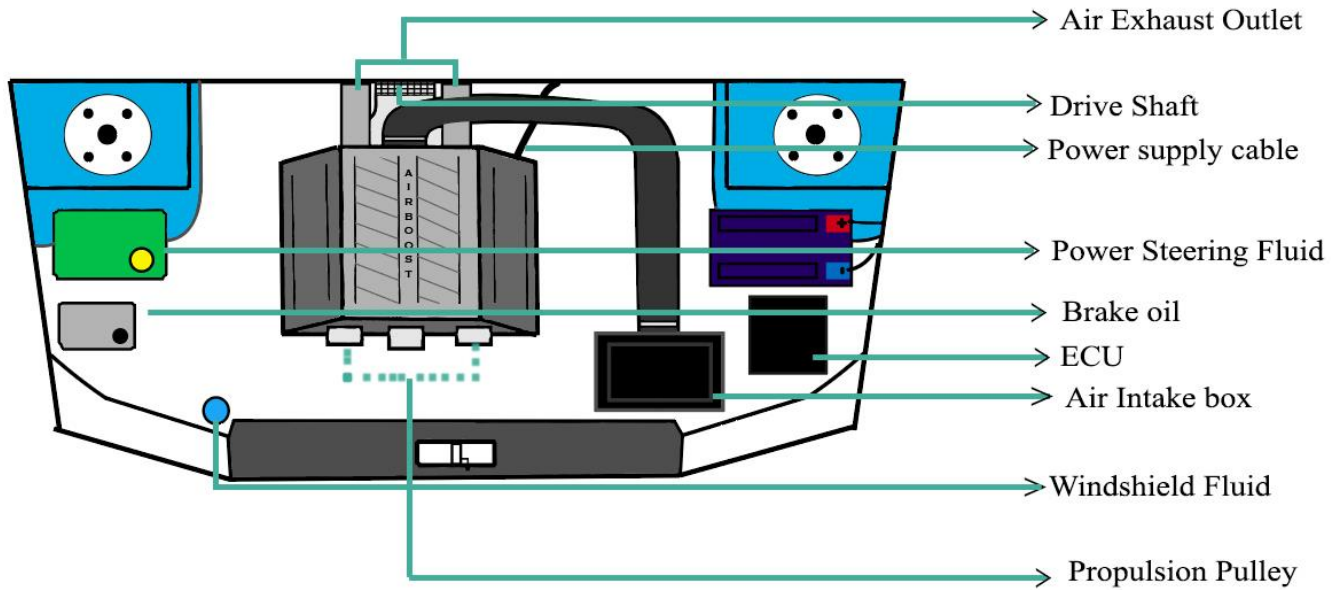
As like the phase I kit, the compression, purification and distribution process are the same, since, both Phase I kit and Phase II kit is about including air boost engine in the existing framework of the automobile's design. The same way, in the compression stage, the air entering the engine is directed by the upper supporting propeller to flow through the upper propellers where the preliminary stage of compression happens, then the compressed air flows towards the second set of propellers, "the lower propellers" where the compression gets intensified. The

generated mechanical energy is directed to the transmission via the lower supporting propeller. As explained in Phase I, the pulley- belt system further enhances and adds efficiency to the compression process and energy generation process by keeping the propellers in rhythm. The transmission regulates and distributes the energy received from the engine depending upon the gear set by the user through the shifter. The differential gear receives the power from the transmission through the driveshaft and distributes it to the wheels via the half shaft. The air that enters the engine gets exhausted after purification.

This is the functionality of the air boost engine, as it is evident that the technology doesn't use any sort of chemical based fuel to generate energy, this is a pollution free concept and the circulation and purification of air enhances the quality of air in the environment add to the eco-friendly perspective. As explained before, because of the engine mode feature the powering engine can be switched between the two by the owners preference, And then when the consumer prefers the internal combustion engine to be the power production, the power supply sent to the air boost engine will be stopped, and the power supply will be switched to the internal combustion engine by the switchover module. And the power production and functionality of an internal combustion engine will be untouched with the phase II kit air boost install and the procedure of power production and power delivery will be the same as it was before the Phase II Kit install.

4.1.3 PHASE III – ADVANCED AIR BOOST TECHNOLOGY

The third phase of air boost technology is about how this technology can be incorporated in an entirely new framework of automobile construction. This phase of the air boost technology excludes all the avoidable components from the traditional design and advances the process of phase I kit that helps in delivering air boost technology in an efficient manner. Phase III of the air boost technology is more economical and beneficial technology than the phase I version. Phase III of the air boost technology amends the components that it would hold in a traditional design. This amendment to the chassis' design reduces the weight of vehicle enabling the performance of the air boost engine to be more powerful and capable.



4.1.4 HOW PHASE III DIFFERENTIATES FROM THE PHASE I

Phase I of the air boost technology is about how the air boost technology can be incorporated in the existing design of the automobile but the phase III of the technology discusses on how the air boost technology functions in a new setup of automobile functioning that could advance and improve the delivery of this technology to its best capacity. Phase III's design is based on Bernoulli's theory, though phase III has kept the functioning of the air boost engine unaltered, the process and the means of delivery by which the generated mechanical energy is transferred to the wheel for the vehicle movement has a major modification that plays a significant part.

The air chambers placed in the chassis adds to the aerodynamic design of the automobile and helps to adjust the drag in optimizing the performance level of the vehicle. It also creates a cushion effect reducing the weight of the vehicle and reduces the stress imposed on the suspension of the vehicle. Further this allows automobiles to provide a comfortable and a smooth ride even while driving in an undulated road surface.

The main difference between Phase I and Phase III of air boost technology is that Phase III is enabled with gearless transmission design and the design of the chassis is based in Bernoulli's theorem that adds to better equip the delivery as like the what would be got with better mileage feature in an internal combustion engine.

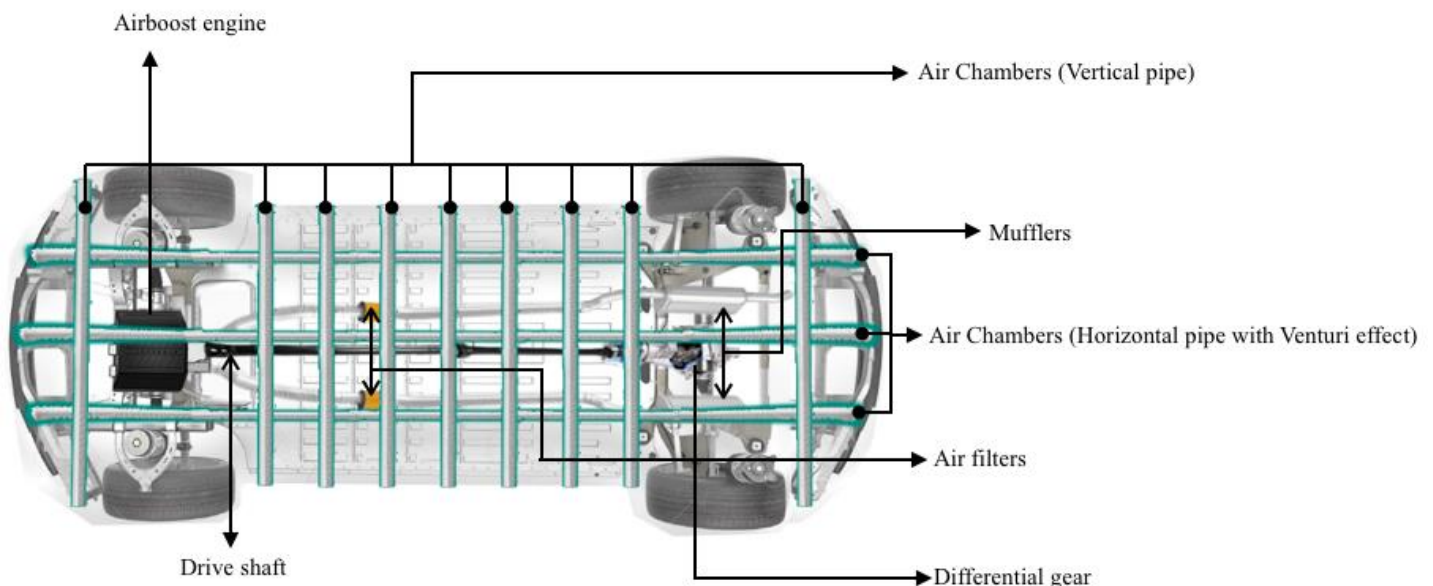
4.1.5 WHAT IS BERNOULLI'S THEOREM

Bernoulli's theorem states that speed and pressure are inversely proportional, that is, with decrease in pressure, the speed of the fluid increases. Vice versa, with increase in pressure, the speed of the fluid decreases. Bernoulli principle or Bernoulli's theorem is used to designing planes. It's principle helps in using airflow to defeat the gravitational force and adjust the drag force of an automobile. It also plays a part in the aerodynamics characteristics of any automobiles, from a basic daily driven automobile to a high-end sport performance car, everywhere, Bernoulli's principle has its part. In the normal vehicles, Bernoulli's principle help to achieve lightweight body structure and fuel efficiency and in sports performance cars, it helps in adjusting the vehicle's drag force according to the desired drive performance. Bernoulli's principle is also being applied in airplane's wings and it shows that a shape of a wing and the way the wings movement can cause changes in an airplanes to lift, drag, changing directions and landing. Same applies for automobiles to design aerodynamics parts like a rear spoiler, front, rear and side splitter, etc to achieve maximum performance of the vehicle. Bernoulli's principle utilizes air as its source to increase and decrease downforce of a vehicle, pressure level in a still air is higher than the air that is moving, The higher pressure in the still air causes the gravitational force, thus causing when a spaceship enters the space to float as the air pressure level outside earth which weakens the gravitational force. Thus car manufacturers use a spoiler a.k.a rear wing to keep the car planted, so the air doesn't lift the wheels of the vehicle causing wobbling and making the car unstable at high speeds. This shows that when air is moving, the low pressure cause the vehicle to lift its weight, that is Bernoulli's theorem. Bernoulli's Theorem Implies to make sure that the fluidic gases or air in this circumstance flows horizontally that there is no changing gravitational potential energy occurs.

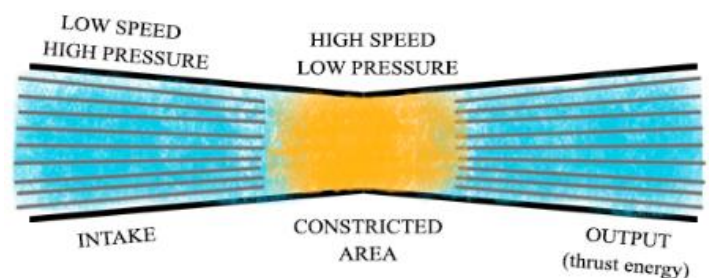
4.1.6 HOW PHASE III AIR BOOST TECHNOLOGY WORKS

As described earlier, the phase III of the air boost technology doesn't change anything about the air boost engine that is described in the phase I, but the phase III modifies the chassis using the Bernoulli's theorem to control and optimize the car's engine performance and to help the chassis provide additional support to the engine and work better with the air boost engine in making it more efficient and productive.

Phase III of air boost technology has multiple air chambers in the chassis that's placed both in the horizontal (connecting the front and back end of the chassis) and vertical (connecting the right and left side of the chassis) that has baffles (valves) attached to each of it.

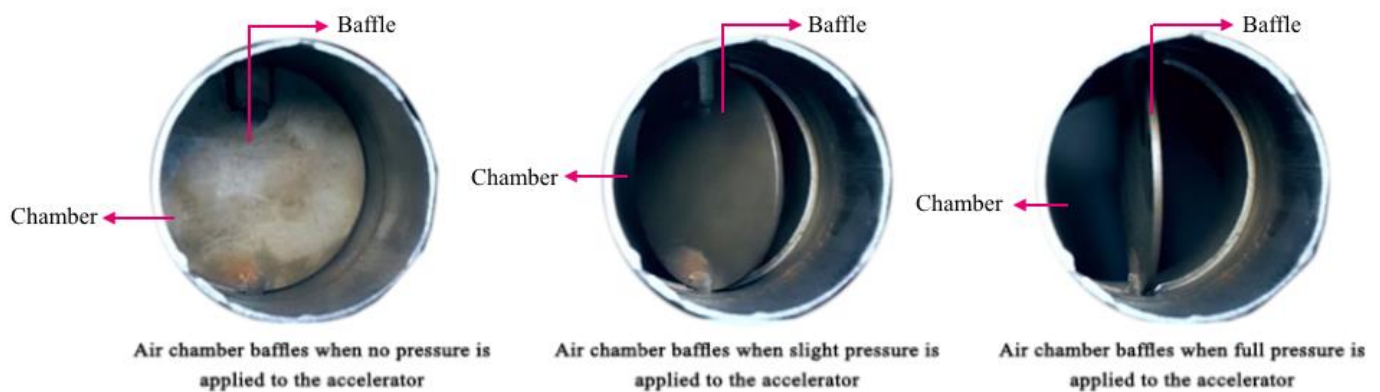


The horizontal pipe of the chamber, which is laid from the front end of the automobile to the backend of the chassis, is designed to be with venturi effect. The pipe has a broader circumference at either ends and the middle part is constricted to have a thinner circumference. Air that passes the pipe when reaches the constricted part gets a higher



speed that adds to the total thrust energy generated by the air boost engine for the automobile's motion enhancing the efficiency of the air boost system.

The vertical pipes directs the crosswinds adding to the down force and balance for the automobile. The baffles that is connected to each ends of the pipe is connected to the accelerator through the ECU. In the sport or track mode, the baffles open up to enhance and add more down force to the vehicle, whilst in the normal drive mode, the baffles opens up and closes according the pressure applied to the accelerator pedal.



Here, in the phase III of the air boost technology, the process of the engine's functioning is the same while the output method and the transfer of generated mechanical energy from the engine's lower supporting pulley to the wheel differs. Let us see this process in detail,

At first, as usual, the air is taken in and filtered where the air is sent into the air boost engine, the upper supporting propellers directs the received air to the upper propellers where the initial boosting process occurs, the boosted energy then reaches the lower propellers where the energy generated gets intensified. The air is sent to exhaust via filters.

The generated energy unlike being sent to the transmission in the phase I, the mechanical energy generated is sent directly to the differential gear via the drive shaft, here, in phase III.

Depending on the differential gear's ratio, the number of rotation needed to be taken by the driveshaft for every turn of wheel is determined which then puts the half shaft and wheels to

function accordingly.

The presence of baffle allows the flow of air into the chamber in such a way that it corresponds its functioning with that of the air boost engine, doubling the total output for the vehicle's performance. The presence of air chambers reduces the body weight of the vehicle without compromising its structural rigidity. It also relieves stress on the suspension reducing the tire thread's wearing thus increasing the lifetime of tire and the suspension components.

This is how the Phase III of the air boost technology works. As described above the air boost technology is the core in whole of this automobile architecture book, and the technology's each phase shows how versatile and efficient the air boost technology is. The air boost technology is a proper way to introduce sustainable and efficient automobiles for the future and emphasizes the evolution of automobiles to be eco-friendly on a greater scale.

4.1.7 APPLICATION OF AIR BOOST ENGINE IN ALL MODES OF VEHICLES:

Initially, air boost engine was conceptualized for cars, later, during the process of research an idea of applying Archimedes principle of buoyancy enabled the idea of expanding the application of air boost technology to all modes of vehicle.

Heavy-duty vehicles mostly are box shaped, the usual lift than an aerodynamic vehicle experiences goes missing. Also, since the vehicle is boxy, while in motion the air force hits the front area of the vehicle adds extra drag force to the vehicle making it difficult to generate force for the maneuvering the vehicle with load.

Archimedes principle states that a body that is completely or partially immersed in fluid experiences an upward lift or buoyancy equal to the weight of the fluid displaced by the body. Generally, we consider liquids to be the only fluid, in that case, how would Archimedes principle work with air boost technology?

Actually, air is a fluid too. A fluid is any substance that flows and takes on different shapes. Air is generally made of air particles and stuffs that are loosely held together in a gas form which can both flow and take up different forms of shape making it to be qualified as a fluid.

The air chambers added to chassis as described in the phase III of air boost technology acts as an air dam factor of the aerodynamic design, that directs and collects the air force smashing the front end of the vehicle, thus reducing the drag force it would add.

Using the baffles to arrest the air and regulate the flow of air within the chamber depending upon the terrain traversed helps in generating extra lift or thrust force needed for the vehicle's transit. When the air passing through the air chamber is arrested enabling slow release, it acts similar to the volume of air held in lungs during swimming that enables one to float in water. The vertical air chambers in this design enable stability to the vehicle by creating passage for the crosswinds to pass by.

4.1.8 WHY AIR BOOST TECHNOLOGY?

Air boost technology is a positive alternate to the existing internal combustion engine that takes away the negativity of carbon footprint and air pollution caused by the use of combustion engine.

Air boost technology is an eco-friendly concept that not just eliminates polluting and climate change but also reduces pollution that already exists in the air through its filtration process.

This technology emphasizes towards reducing need for fossil fuel by altering it with air, a freely available natural resource as its fuel source that would help in reduced pollution, including temperature by creating turbulence, thus dissolving boundary layer constraints. It also simplifies the functioning of the automobile resulting in reduced the production value, which makes cars more affordable, mankind valued in better form than being rigid and vulnerable. Air boost technology can be implemented in any mode of transportation. The design was originally

submitted as a concept in my paper earlier but in the next chapter, I have explained it briefly on how the technology functions and what are the changes and prospects it can bring to the automobile industry and for the society.

This technology will bring transformation on the engine's characteristics that power an automobile. It can change the environmental condition by purifying the air, which would further result in reducing the pollutants in air enhancing the quality of atmospheric air. Pollution, today is a serious concern, due to continuous increase in the vehicle population, pollution intensity is also increasing that can cause serious trouble to both the environment and the mankind. This technology can help in resolving two major issues in the automobile industry, which is pollution and fuel demand.

The technology also utilizes substantially fewer parts to function compared to a traditional internal combustion engine, which will impact in a reduced production cost of a car. This can help in manufacturers selling cars at much affordable pricing, which will help in car's reaching much wider consumers. Reduction of mechanical parts that complicate the operation of a car has also been simplified. This technology is a power production material, it can be utilized in any mode of transport and as said before in this book I have further researched into how does a car and internal combustion engine function in producing the power and deliver the power in order to produce momentum, to make the air boost technology practically functional in the real world scenario without any practical difficulties. As technology has no difficulties and can work in the real world scenario with no defects, the technology was submitted as a concept in an imaginary perspective, further researches are done on the technology, which helped in redesigning it to fit in any mode of transportation and produce power to move the object without an issue. While this book strictly focuses on the architecture, it is not focused towards engineering and science, as the technology should be optimized as per the vehicle weight, and purpose of the vehicle build for. This Research will produce the technologies at a more suitable to the real-world type of functioning mechanism. Technology can be served in multiple transportation methods making it versatile, not only does the technology utilizes air as its source of energy production but it also purifies the air before exhausting helping in purifying the air.

Technology is also advantageous, as it doesn't use fuel to generate energy. So, when the technology comes to effect as a power train in the mass production it will cut down on the rising fuel issues around the globe and help to make fuel available at all times without any fuel inadequacy without any fluctuation, at the same time keeping the price of fuel at a nominal rate. Reduction in fuel usage helps in reducing pollution. Vehicles emitting polluted air is one of the major influences to global warming. Reduction in gasoline prices will also help with the driving enthusiastic consumers who are particular about driving a car powered by an internal combustion engine. Air Boost Technology can be implemented in ships and planes as it functions through the water and air, it becomes much easier for the motor to function in those modes of transportation as these vehicles travel on an open surface and have more surrounding space, liberating more air.

Breathing polluted toxic air can cause serious health issues in a human body, in a long term exposure to the polluted air it can cause serious issues to lungs and heart, as the respiratory system works harder to function and supply oxygen to the body and parts it can lead to faster aging of lungs, creates breathing related diseases like asthma which can lead to shortening human life span. These issues can be solved with the introduction of the air boost technology, the intention is not to make the internal combustion engine to be discontinued but it can be reduced to a lower number dedicated to the driving enthusiasts yet the Air boost engine can serve a common mass audience who use the automobiles just for the commute from one place to another.

4.2 FLYING CAR MECHANISM

Flying car mechanism was designed to reduce the traffic congestion in the road and to reduce the wait time of commuters in a bumper-to-bumper traffic that would help them invest their time usefully. Flying car mechanism helps us to eliminate the need for road enlargement that otherwise is needed to accommodate the increasing population of automobiles. Flying car mechanism's implementation can also save resources for the government and help preserve nature. While the prospects that the flying car mechanism can bring to the civilization and the environment will be explained in the next chapter, 'prospects and changes', this chapter will focus on the technology and the functionalities of the mechanism.

So, the flying car mechanism uses the air boost engine as its power source for two reasons,

- (i) Firstly, the air boost engine is considerably lighter than both the internal combustion engine and the electric engine, as it eliminates all complex mechanical parts and uses minimal internal parts that result in reduced weight of the automobile on the whole.
- (ii) Secondly, while the car is on the air, air boost technology can produce more power efficiently than any other powertrain. Also, if it is an internal combustion engine, apart from the engine's mass, the weight that would be added by the placement of fuel tank and fuel filled in it, needs to be considered, which eventually makes the air boost engine, a better option for this mechanism.

The flying car mechanism helps in reducing multiple rising issues in the automobile industries and the society, so bringing this concept to reality can be a solution to issues like, the destruction of nature, health risks and time delay. Like mentioned above, the flying car concept uses the air boost engine as its source for power production, the concept uses the air boost technology's phase III, which works with the Bernoulli's principle, which further helps in reducing the body weight of the vehicle enabling the flying mechanism to work effectively.

4.2.1 HOW IT WORKS

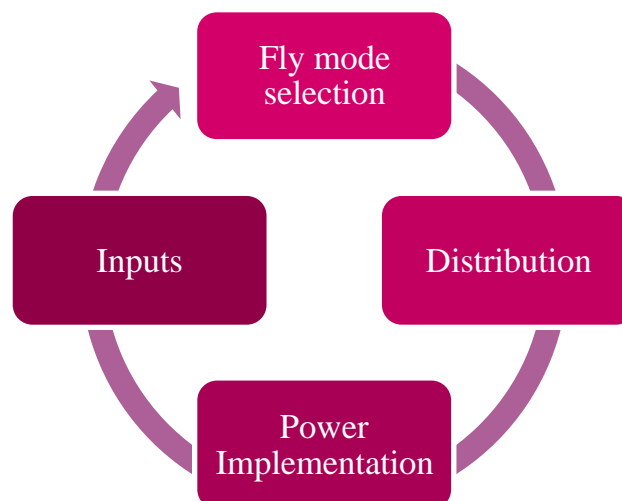
Before getting into detail on how the mechanism functions, let's see a step-by-step process on how the mechanism functions in a nutshell to get a better understanding of the concept.

STEP-BY-STEP PROCESS

- Fly mode selection – in the drive mode selector, drive mode could be opted between normal mode and fly mode.
- The suspension flexes – upon selecting the fly mode in the drive mode selector, suspension flex out and orients the wheel through the wheel flex axles towards the surface and the wind blades open up along the bodylines

- Exhaust airflow is diverted – the exhaust air flow that usually exits the car through the exhaust pipe is diverted to the wheels that exhausts through the wheel spokes generating better speed and momentum
- Idle RPM increases to elevate the vehicle into the air
- Vehicle moves depending on the pressure applied to the throttle
- Wheels turn in an angle depending on the steering inputs
- Wind blades moves depending on steering and throttle response
- Upon surface mode selection
- Automobile slowly reaches the surface and retracts the wheels back to its normal position
- Wind blades retracts into the body lines
- Exhaust air is reverted back to be exhausted through the exhaust pipe.

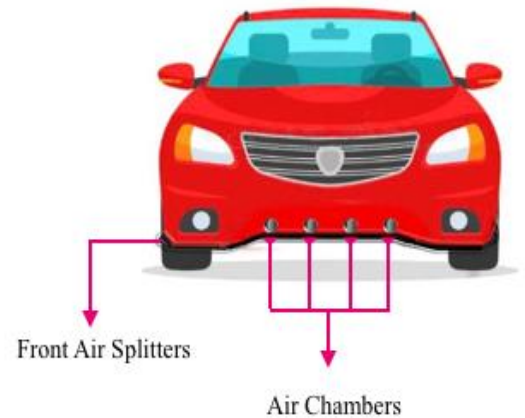
The flying car mechanism consists of 4 stages of actions in its functionality, which are,



Now, let me explain the functionality of the concept briefly.

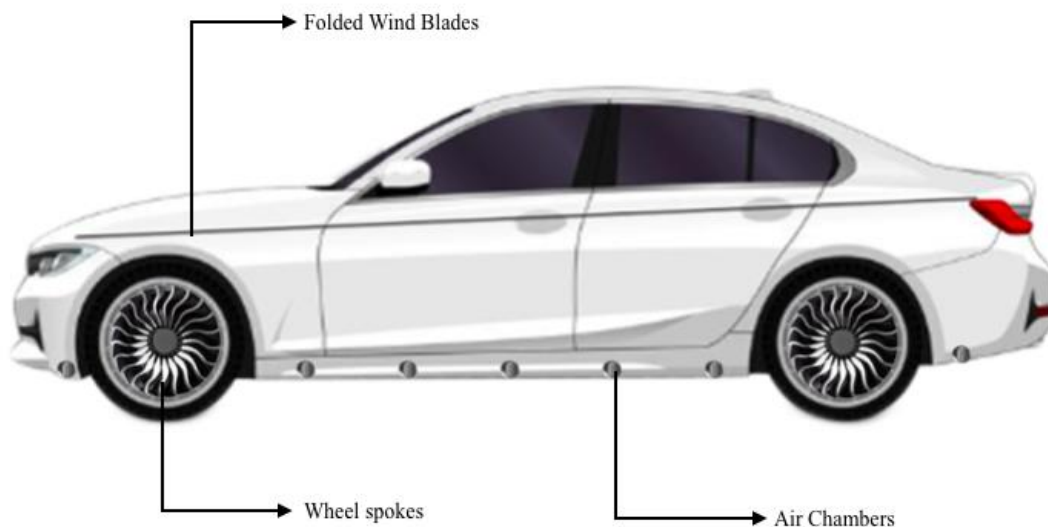
4.2.1(a) FLY MODE SELECTION

The emphasizing element of flying car mechanism is that the user is enabled with the option to choose between the drive modes as per their preference, the desired drive mode can be selected through the drive mode selector. By choosing the flying mode, the suspension arches down towards the surface, while the rims are facing the floor, the exhaust air is being diverted to the wheels, unlike the usual of exiting through the rear bumpers. When the air is being exhausted through the wheels due to the spokes in the wheels it replicates the propellers power implementation method, it helps in elevating the automobile into the air space.



4.2.1(b) DISTRIBUTION

When the car starts flying, the power produced by the air boost engine gets distributed to all four wheels through an all-wheel-drive system. Depending on the throttle, the wheels spin faster or slower, this helps to keep the car on air.

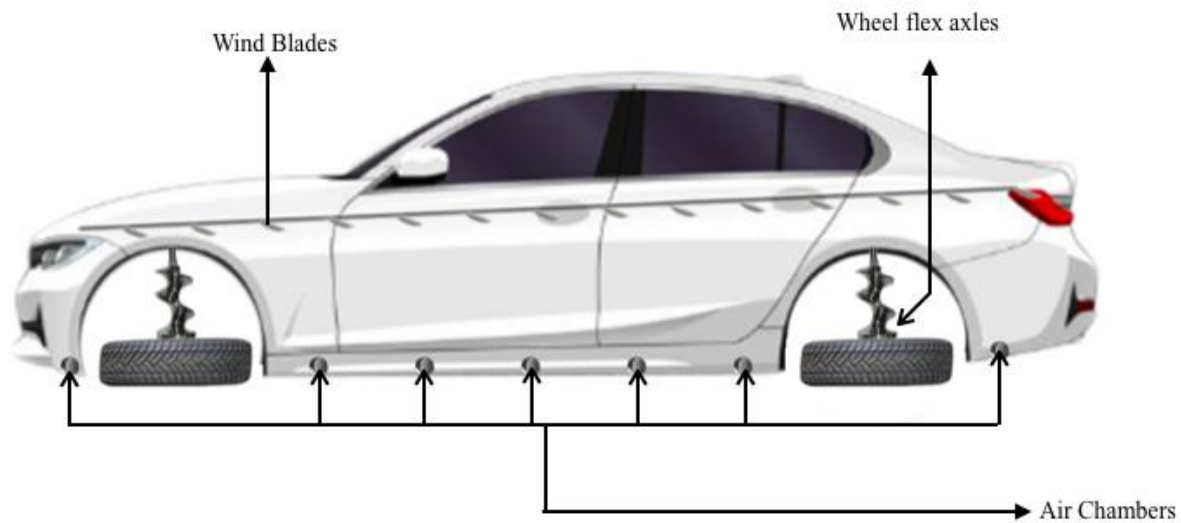


By monitoring the vehicle's chassis angle, wheel that lacks thrust is identified and power gets distributed appropriately through the all wheel drive mechanism that allows power to be distributed to wheels independently. The specialty of the all-wheel-drive system is that when the user is driving the vehicle on the surface, it allows the consumer to choose between rear wheel drive and all wheel drive mode to experience various driving characteristics from the same vehicle, while when the fly mode is being selected the automobile automatically switches to all-wheel-drive mode. The flying car concept is extremely functional by reducing the complicated and heavyweight components of an automobile, this makes the flying car mechanism functional and efficient.

4.2.1(c) POWER IMPLEMENTATION

While the power is being distributed to all four wheels, the implementation of power is extremely vital to understand, while the automobile is being escalated from the surface, the automobile's momentum to move forward will be executed by the whirling of wheels at speeds depending on the throttle pressure applied. As the wheel rims are designed to replicate the design of propellers, the exhaust air that is diverted to exhaust through the wheels in the fly mode drive, this combination of wheel spin delivered by the mechanical energy generated through the air boost engine and the high speed exhaust air pushed out from the engine through the spinning wheels replicates the functioning of jet propulsion. This keeps the car in the air and helps in moving the car forward or backward. With the help of Bernoulli's principles, the chambers placed in the chassis will help reduce the weight of the vehicle. The baffles in the air chamber will be closed until the needed lift is generated. Then, the baffle's operation can be adjusted according to the throttle pressure for it to compliment the engine's functioning. Because of the weight reduction, the power produced by the air boost engine will be implemented efficiently without loss or wastage in drag or down force. Learning the Archimedes principle and buoyant force helped in understanding the importance of concept like, weight distribution, aerodynamics and balance involved in the construction of an automobile. The aerodynamic value of the flying car mechanism has been derived from learning about the Archimedes principle, reading and implementing the Archimedes principle into the design of the flying car mechanism and the air

boost technology, further increases the reliability and functionality perspective efficiently.



4.2.1(d) INPUTS

As the power implementation of the mechanism has been explained, the inputs that the flying car mechanism needs post being escalated from the surface is very much important. The “Inputs” title further discusses on the design of the flying car mechanism and what makes the integration of its design change important and why it is a requirement. Once the automobile enters the air space the car's controls are relatively similar to that of a car being driven on the surface, this enables the user to feel the interface of flying mechanism comfortable and friendly, it further reduces the clumsiness. The pressure applied to throttle will support move the car forward and when throttle is being applied, the wheels angles towards the rear generating forward movement and when the throttle pressure is being let off the car comes to a still in the air space, here, the idling of the engine will be tuned to increase via the ECU that helps the car to maintain its buoyancy in the space. Piloting the car’s direction can be done through the steering as usual, wheels will turn according to the steering operation executed by the user. The wind blades positions along the sidelines of the car’s body help in faster and smoother flight, reducing the delay or lag. And once the car reaches the surface the wind blades will be retracted inside the body to suit with the federal road pedestrian road safety rules and regulations.

This is how the flying car mechanism functions, the simplicity in the design and parts used

will help the car to be manufactured and sold at an affordable cost, increasing its reach to the audience. It's easy to use interface further increase the user-friendly perspective of the concept. Further, the benefits that can be availed by implementing the technology has been explained briefly in the upcoming chapter "Prospects And Changes". The Diagrams has been provided to help visualize the concept.

Implementing Archimedes principle and Bernoulli's principle in flying mechanism enables the mechanism to be tunable, it enhances the performance of the air boost engine, enhance the ride quality. With better drive quality, the fatigue experienced by the user can be reduced, as the body weight of the automobile is considerably reduced and the aerodynamic features of the automobile enhanced with air chambers and wind blades, the vehicle feels like gliding through air rather than piercing the air force.

4.2.2 WHY FLYING CAR CONCEPT?

Flying car concept was designed originally in order to reduce traffic-related issues, as most car and cab concerns are working towards the concept of drone. I derived with this concept of "flying car mechanism".

Air boost technology is placed as the basic power generating source for flying car concept not just because the air boost motor can be more capable and practical but also for the reason that the air boost engine is comparatively lighter than the traditional internal combustion engine and the suction of air surmounting the automobile will help in generating good thrust force. Air boost engine is preferred because it is an alternate for ICE that causes pollution and other ecological imbalance. The lighter weight of the car not just helps in easier lift and flight but also helps to float in air while it is idle. While researching about the flying car concept design I also read an article on an ancient concept called "Pushpaka Vimana", a mythological flying chariot concept that was said to have existed years before in 3rd century, existence of vimana back in this period can be evidenced from the scriptures. How was it possible to fly vehicles, analyzing the science behind, it could be found that they used the anti-gravity to fly, how was this anti-gravity achieved? It was by applying force greater than that of the vimana's total weight and

gravitational force. Increased forward force enables acceleration, paced force helps the vimana to cruise and opposite force to the forward thrust enables braking.

That is in order to generate acceleration, the vimana is angled in such a way that weight is added in the front creating forward motion, the opposite of this helps in generating brake force. In this concept of flying mechanism, the functioning of wheels in the fly mode is designed in similar way. The air chambers, air boost technology that takes in air surrounding the vehicle creating vacuum are all aerodynamic and buoyant factors that adds to the factors of making the vehicle lighter that suffices the force created by the boosting motor to enable anti-gravity.

It is also said that, the vimana used vortex engine and in the recent times ion engine are becoming popular means of propulsion. Vortex means whirling mass of fluid or air. Mercury was used to create the whirling effect, as technology wasn't so advanced those days, there weren't distinct equipment dedicated for specific purpose. In order to generate whirling effect, today we have several different alternative which would enable us generate it, but back then where products and advancements in technology weren't this handy that they need to discover and invent a process that would enable them achieve the whirling effect (vortex) that they used mercury for its properties and characteristics. When the mercury whirls, it generates air turbulence resulting in vortex that acts as source for propellant's functioning enabling lift. The concept design of spoke wheel design and exhaust of air through the wheel in the flying car mechanism is a simile to this vortex functioning. On the other hand, in few places, it is said that ion thruster as supported by NASA's research were used to fly the vimanas. The process of ion engine again is the same, inside the chamber, ions are accelerated inside the thrust chamber, accelerated ions passes through grids having thousands of precisely aligned holes that pushes out ions as beam generating thrust. Here the set of grids used are (i) screen grid (ii) accelerator grid. Screen grid is negatively charged, accelerator grid is positively charged, grids are assigned with specific charge attributes for it to attract the ions towards exhaust. This attraction of ions adds to the velocity of acceleration which when moves through grid holes gains further velocity by applying the venturi effect of Bernoulli's principle. Thruster engine involves two concepts, turbulence or acceleration process inside the chamber, exhaustion of ion through grid designed under Bernoulli's principle that would act in enhancing the output energy of the thruster. Both

of these concepts of turbulence generation (air boost engine) and enhancement of generated energy through Bernoulli's principle are part of flying car's concept design, higher end propellants and advanced process are used in thruster for it is designed for jet that is used for space travel.

Therefore, 'buoyancy', 'turbulence', 'vortex', 'venturi effect', 'wheel orientation' are the factors proven to be the essential parts of the flying concept, having all these included in flying car mechanism strengthens the prospects of this concept design being practical and executable.

Flying car concept is a solution to address the problem arising out of increase vehicle population. With automobile markets witnessing constant launch of automobiles variants with frequent upgrades and advancements made to their previously launched model, persuades consumers to switch their vehicle in order to own a sense of being updated and in trend. Secondly, Increase in vehicle population is eventual with increase in human population. Bringing the flying car concept would address congestion issues in roads and currently flying car is one of the talks in the automobile industries.

Increased vehicle population demands expansion of roads and construction of flyover to accommodate the population and streamline the congestion. Expansion of roads means destruction of nature, conversion of existing road design that would take off or cut short the provision of pathway, road bunks and storm drains in the existing road structure, all these concerns could be addressed by implementing flying mechanism. Flying cars will also help in reducing halt interludes, fuel wastage, idling pollutants caused by traffics. Further, the turbulence in the atmosphere created by the vortex effects of flying car concepts, enhances the atmospheric state as it mixes and churns the atmosphere making water vapor, smoke, energy and other substance to become distributed.

Automakers and cab concerns are working on building drone transportation to fly over the traffic. The approach taken towards designing the flying car mechanism is focused to the purpose that it stands economical and environmental friendly along with being a fantasy. Than adopting the technology as such from the aeronautics, if the mechanism involved in the process of flight

is taken, a new technology that is both feasible and progressive can be found enabling it to not just be fruitful but responsible too. As this technology is designed in a way to enable the user to switch between fly and surface mode, drive mode can be opted for the preference of the user and purpose of the drive making this technology versatile and flexible. Bringing this flying car technology to reality will benefit both the industry and the world, to the automotive sector, implementation of this technology brings in a paradigm shift and to the world it helps in protecting the environment and in creating a better life standards for people, by being economical.

4.3 ANTI FIRE TECHNOLOGY

Anti fire technology is a concept that was designed to reduce fire accidents in automobiles, and reduce the damage caused in case of a fire accident. The technology's objective is to reduce the risk of an automobile to catch fire, to build a trust and confidence for the user in their automobile and reduce the risk of losing a life or property. Anti fire technology is a concept that detects whether an automobile is catching fire at a very premature stage before the fire engulfs and spreads into something serious and sets the fire down at a preliminary stage and intimate the passengers in the vehicle that there is a problem in the automobile which could lead to a fire accident.

The anti fire technology was designed to lessen the risk factor involved in driving or riding in an automobile. Though an automobile catching on fire is rare, when it does the damage and trauma it can cause to the user is huge. This technology helps in reducing the issue by less to none. The technology functions through pipes that run across the car's engine bay and chassis that sprays water mixed with foam in case of a fire accident before things get out of hand. Before seeing how the technology functions and how it works, let me explain why the technology was invented and the importance of the concept and which made me design the technology, for the better understanding of the technology.

4.3.1 ORIGINATION OF THE IDEA

The origination of the anti fire technology occurred when I came across a news of car fire

accident, a car that experienced a crash caught fire, the car's door got crushed and locked making it difficult to open for the passengers to escape which unfortunately costed their lives.

Upon hearing this news, the situation sparked the concept of anti fire technology in my mind. During the research of car fire accidents around the world, I realized that though this isn't a frequent occurring problem, when it occurs the impact it leaves is huge. It creates trust issues with automobiles for the consumers and it's something that scares a person forever. Anti fire technology has been designed after reading the news articles related to fire accidents, the design and parts involved in the anti-fire technology is kept minimal, which makes the technology simple and functional without adding much weight to the vehicle. Implementing this technology will add a sense of enhanced trust and confidence for the users and commuters that even the risk that has lesser probability to occur is taken care of. It also reduces the impact of losing a life in an occurrence of a fire accident making automobile to be a much safer transport medium, further avoiding a car collision scene from escalating into a fire accident.

While we are in the topic of discussing the fire accidents, which sparked the concept for the anti fire technology, let me explain what are the most common causes for an automobile to catch on fire.

4.3.2 CAUSE OF FIRE ACCIDENT

Causes of a fire accident, the topic discusses on the most common causes for an automobile to catch on fire, to help understand the anti-fire technology's functionality and efficiency better. It takes certain things for an automobile to actually catch fire, an automobile is filled with a lot of wiring harness and fuel that are extremely flammable, though these are sealed and protected by the manufacturer to avoid such occurrence. It does happen when the automobile is being tossed around and abused by the owner or due to poor maintenance because the automobile is being old or even due to neglecting to replace certain parts to avoid the situations, which causes fire accidents apart from collisions.

Let me describe the causes for an automobile to catch on fire in bulletins.

- FUEL SYSTEM LEAKAGE
- ENGINE FLUID LEAKAGE
- ENGINE OVERHEATING
- FUEL TANK HEATING
- ELECTRICAL SHORT CIRCUIT
- CAR CRASH
- BATTERY POWER LEAKAGE

These are the causes for an automobile to catch on fire, but how do these causes lead to an automobile to catch on fire, let me explain the causes briefly on how it leads to a fire accident.

4.3.2(a) FUEL SYSTEM LEAKAGE

Fuel system leakage is one of the common cause for an automobile to catch on fire, when a car is involved in an collision, the fuel supply lines crack and snaps leaking fuel on top of blazing hot engine and exhausts leading to an automobile to catch on fire. To avoid this situation manufacturers have installed a safety feature that automatically disables the fuel supply when a collision occurs.

Though this feature reduces the danger of the fuel leakage on a collision, on an severe collision the fuel lines can pop out of the fuel connectors causing the fuel to leak, but in a scenario where the automobile isn't involved in an wreck, The fuel supply lines are held responsible to set the automobile on fire because of neglecting on maintenance by the owner to replace the worn out cracked fuel lines that are due for replacement.

4.3.2(b) ENGINE FLUID LEAKAGE

Internal combustion engine in an automobile contains variety of fluids, like, engine oil, brake oil, coolant, transmission fluid and power steering fluid. These fluids are stored in reservoir located in the engine bay, once the engine is cranked all the mentioned fluids starts circulating, so the issue of fluid leakage can occur with a faulty or a worn out supply lines or a cracked reservoir, when the oil or fluid leaks it spreads all over the engine bay, when the fluids reach the engine components and the exhaust manifolds it causes the automobile to catch fire.

4.3.2(c) ENGINE OVERHEATING

Engine overheating can be common cause for an automobile to catch fire, though before an automobile is being enabled for the public to purchase, the manufacturer put the car to multiple tests to make sure that the car can handle the amount of abuse depending on the purpose of the vehicle. The car is being provided with all the necessary fluids to keep the engine functioning without issues. Despite all these provisions and tests, issues occur due to non-maintenance or careless maintenance of the consumers.

Internal combustion engine can also overheat during continues driving in a burning hot temperature where the intake air from the atmosphere outside would also be hot causing the engine to overheat but this situation barely occurs. As said earlier the manufacturers perform multiple tests and make sure due precautions are provided that automobiles aren't vulnerable to catch fire but if the provision aren't maintained and refilled duly by the users could cause fire accidents. Lack of engine oil can lead to a dry engine blocks and cylinders banks, when the combustion process occurs on a dry engine block, the engine overheats, when fuel is being sprayed on a hot cylinder head chances of it catching fire is high and quick. Engine catching on fire, melts the fluid reservoirs, when the fluids drip on a burning engine, it further aggravates the fire. Lack of coolant can result in the overheating, as the engine utilizes coolant as its cooling aid to keep the temperature streamlined.

4.3.2(d) FUEL TANK OVERHEATING

Fuel tank heating is the least possibility that could probably cause a fire accident in on a

modern day automobile. But it occurs due to the exhaust system, the exhaust systems are laid close to the fuel tank and manufactures have replaced the metal fuel tank with a plastic/fiber fuel tank to save weight for better fuel efficiency and performance. When the fuel tanks has direct contact with the exhaust pipe's heat waves in a case where the heat insulation paddings had worn out, the fuel tank starts to heat up building pressure inside the fuel tank which can result in fuel tank blowing up when the pressure reaches the ultimatum.

4.3.2(e) ELECTRICAL SHORT CIRCUIT

Electrical short circuit can be potent cause for an automobile to catch fire, as electrical wires run throughout the vehicle connected from the battery. From the front to the rear of the vehicle, all equipment's and components like, headlights, interior map lights, infotainment system, instrument cluster, charger socket, rear tail lights, etc. are powered through wires. When there's a short circuit the wires start sparking, after a point, the spark ignites itself into fire, as the wiring runs all through the vehicle the fire spreads using the wiring as a fuel when the fire reaches the battery located in the engine bay the battery catches fire escalating the situation further worsen leading to a entire blow down of the automobile.

4.3.2(f) CAR CRASH

Most fire accident with automobiles occurs when the vehicle gets into a collision, in which case, during the impact the fuel supply lines rupture. As mentioned earlier, though the modern automobiles are standardized with a safety prevention feature that cuts off the fuel supply to the engine during a severe collision, the fuel stagnated in the fuel lines may start to leak and spread through the car, when fuel gets mixed with other flammable fluids and that reaches a steamy hot engine the vehicle has a chance to catch fire.

Road accidents occur mainly because of rash driving, avoiding the road safety rules and lack of attention. Multiple safety feature are provided to prevent a collision when the user is not paying due attention while driving an automobile, but in the case of an severe collision, chances if vehicle catching fire is probable. In this case the anti-fire technology comes in clutch and safes lives by setting off the fire before the emergency rescue arrives.

4.3.2(g) BATTERY LEAKAGE

Battery power leakage occurs when the power terminals are not connected properly, which leads the terminals to ignite sparks leading to fire. Or on a battery that charges as the vehicle is being driven from the energy got through the brake energy regeneration and deceleration energy recuperation, when the battery is overcharged, electrolysis of water produces hydrogen gas and oxygen gas, hydrogen gas escaping from the acid in the battery reacts with atmosphere forming corrosion on the terminals. When this corrosion build up is left unattended, in due course it might lead to a fire accident.

As the cause of fire accidents and its possibilities, reasons are explained, let us now look into how the anti fire technology works to fix and reduce fire accident and its probabilities in the future when implemented and the functionalities of the technology.

4.3.3 HOW ANTI FIRE TECHNOLOGY WORKS

Anti fire technology works to protect and prevent a vehicle from catching fire and save passenger's lives. The technology uses minimal parts, that not just recompenses to be light weight but it also helps in claiming the technology cost effective, making this technology an efficient one. Before getting into detail on how the technology function, Let's see the stages that this technology goes through to function.

1. DETECTION
2. INTIMATION
3. INTIATION
4. DISENGAGE

These are the four steps; let us now look at each one in detail,

4.3.3(a) DETECTION

While the technology is indistinguishable for the most parts, the technology starts its function when an automobile is identified to be overheating or smoke in a certain area out of

ordinary is sensed. The detection process is done with the help of multiple sensors placed in the vehicle, like near the wiring harness, underneath the vehicle, in the wheel wells and near the batteries. Sensors are placed in the areas of automobile that are discussed to have the potency to cause fire accidents. Once an area overheats and starts to catch fire the sensors automatically detects the fire.

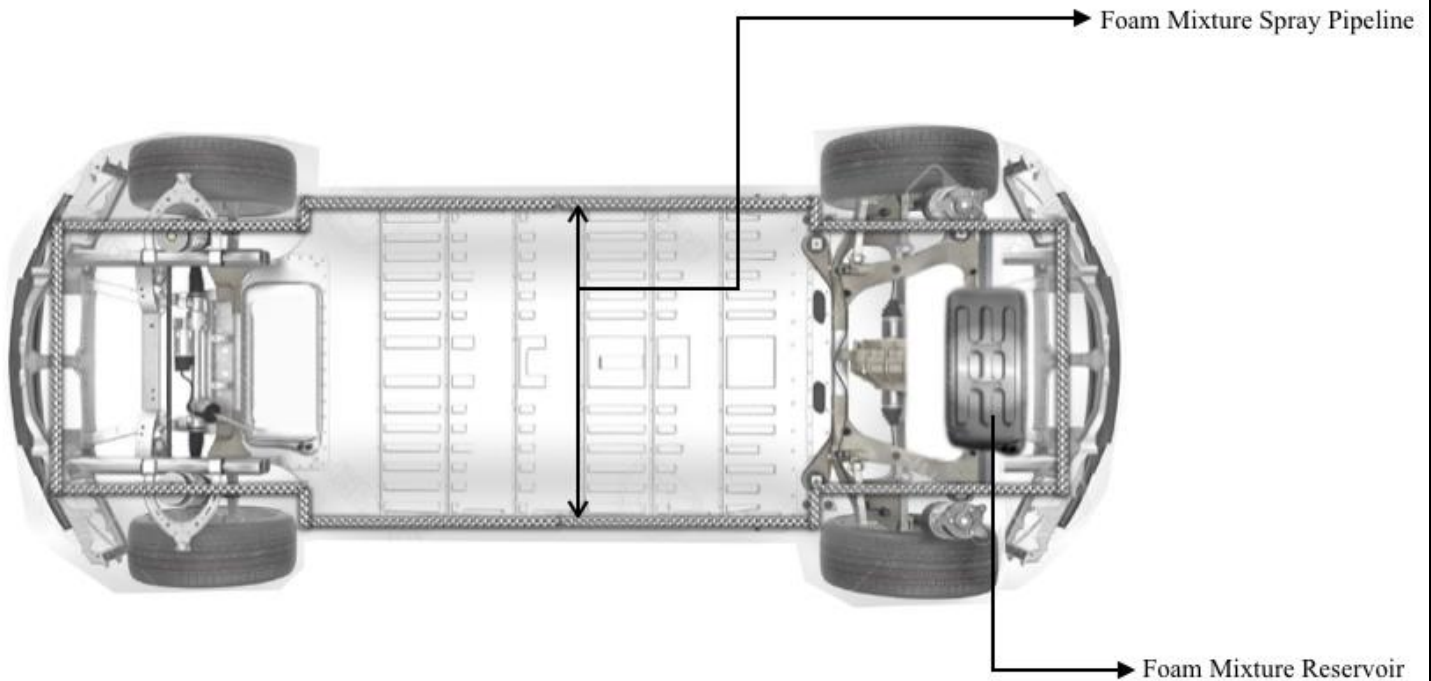
4.3.3(b) INTIMATION

Having placed sensors at multiple places around the automobile, when a particular area is sensed to overheat or smoking, the system is alerted with the same. The system then forwards an audible sound alert and throws a sign displaying the occupants and the user that the vehicle is starting to overheat and seems to have caught on fire, once the intimation is passed to the users, it automatically unlocks and rolls down the windows suggesting the occupants to pullover the vehicle in order to avoid risks of the occupants hurting themselves.

4.3.3(c) INTIATION

While the system is intimating the occupants with the situation, the system also starts to initiate the process to set off the fire reducing the danger by solving the problem at an early stage that prevents severe or serious damage from transpiring.

Firstly, to ensure that the extinguisher reaches the spot and there are no blocks mid way, blowing air preps the pipe, while the foam tank placed beneath the vehicle trunk starts generating the extinguishing process. It starts pumping the foam water mixture and compresses the mixture to eject at high pressure. This process allows the system to use the available foam effectively without wastage, increasing the range of use (higher spray duration with limited foam). Once compressing the mixture, the pump ejects the mixture at a high pressure into the pipelines, the high pressure foam mixture then shoots of the pipelines at a high speed pace, Spraying of foam mixture at high speed and the cooling characteristic of foam smothers down the fire, further the extinguishing solution being foam works more effectively and rapidly in setting off the fire by removing oxygen. This works effectively even when the surface is wet.

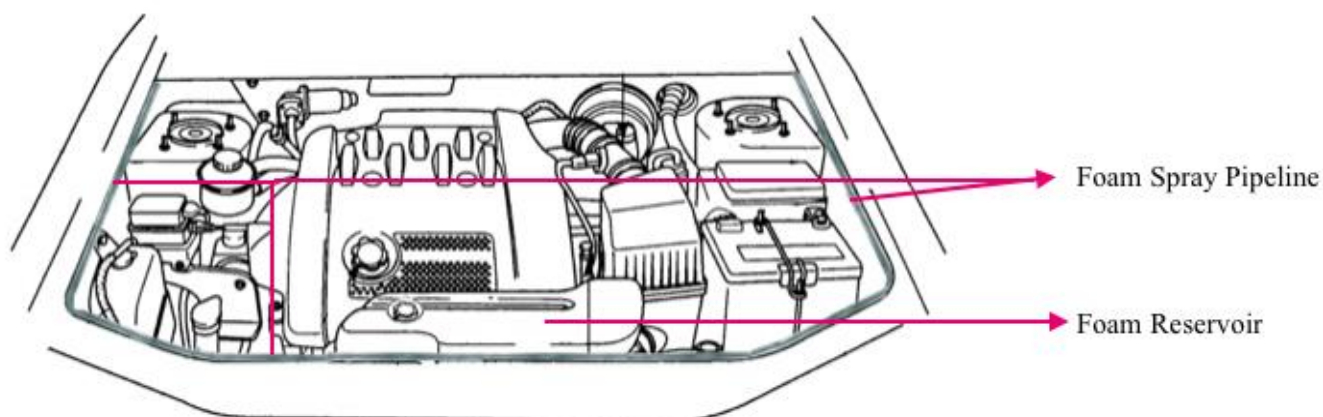


4.3.3(d) DISENGAGE

Once the fire is set off, the system automatically stops spraying the foam mixture and notifies the owner by sending a notification to their mobile that the fire issue has been rectified and reports the vehicle's condition, as in whether it's advisable to be driven further or has severe damage and needs to be checked by the service station.

The system's functionality is simple and the benefits are exponential; the technology helps in making automobiles safer, which is something that the manufacturers are aiming towards with modern cars.

Once the system is used, the only thing to be reset with the technology would be to refill the foam mixture fluid. The technology utilizes two foam mixture tanks, one located upfront under the hood and another underneath the trunk. The expense the technology carries is bare minimum while the expenditures that could be avoided by applying this technology in an automobile are sky high. It further helps make automobiles a much safer transport medium and benefits manufacturers by building trust with the consumers, increasing sales.



4.3.4 WHY ANTI FIRE TECHNOLOGY?

Anti-fire technology is a concept design that was taken after reading through news articles about crash events that turned into fire accidents causing life loss. It made me think what makes a car to catch fire and how it can be fixed. At the end of the study, contemplating all the prospects that could cause fire accidents in an automobile, anti fire technology was designed. Firing in an automobile are caused by several factors, that too in an internal combustion engine where the automobile's functioning itself is sourced through the process of combustion, the risk possibilities of fire accidents are high. Though, manufacturers take furthest attention in designing their vehicles with due precautionary and safety provisions making their products risk and accident free, in an unforeseen situation, despite all precautionary and safety features, if the automobile scopes to catch fire, anti fire technology will come to rescue.

Another major reason that obliges anti-fire technology is the maintenance part of automobiles after sales. Not all users put identical amount of care and give equivalent amount of significance for maintenance of automobiles, which in due course may be a source for fire accidents as most of the process in a traditional automobile involves combustion. Inadequate maintenance of care, failing to refill cooling fluids, etc. fails the precautionary provisions enabled by the manufacturers to avoid fire accidents. Mostly, fire accident in automobiles occur due to car crash, leak in battery or fuel lines, engine fluids leakage, engine over heating and electrical short circuit.

This technology focuses towards reducing fire accidents in automobiles, this technology is designed in a way that fire accidents are detected and treated at a very early stage when the situation is very much under control, enabling the user to be aware of the problem. Without paralyzing the users, a soft alert about the problem is given to the passenger that they take due precaution while the anti-fire technology tends the fire down and intimates the passenger about the vehicle's status after the fire spot is treated. This technology will provide the consumer a sense of trust enabling them to handle the vehicle with confidence. This concept can be used in any mode of transportation making the concept versatile and reliable.

The extinguishing solution used in this technology is soap solution. Even individuals who aren't a maintenance freak could refill the extinguishing solution at ease. Apart from the advantage of being widely and easily available, using soap solution foam extinguisher is economical and effective too. Extinguishing a fire with foam made from soap water uses just one-seventeenth as much water as putting out a fire with just water, as the detergent foam contains water increasing its extinguishing power. Using soap water prevents the need to add artificial chemicals and as the constituents of soap are neutralized, it wouldn't add any damage to the vehicle or the surrounding.

Implementing this technology in a vehicle is easy and simple that doesn't demand any massive or immense modification both in the existing framework of automobiles or in the framework of automobiles that would be manufactured in the future. This technology layout is designed to be simple and purposeful that it stands cost effective. From abnormal heating of components to occurrence of spark, this technology is designed to detect and treat everything in the initial stages itself with due notification sent to the commuters regarding the same.

The prospects and changes that could be made with the implementation of this technology, in the real world are dealt in the chapter "Prospects and Changes". Though the concept of anti-fire technology might look simple and easy, the benefits it enables to the industry in increasing

customer's confidence in using their products and to the people in enabling them a fear-free, comfortable drive is something huge and worthy.

4.4 THERMAL ENERGY CONVERSION

Thermal energy conversion technology was designed to be an upgrade from the hybrid and plug-in electric hybrid engines. It was designed to be more competent and functional on a day-to-day usage. The thermal energy conversion technology is a mechanism that drives the vehicle through electric motor but produces energy to power the electric motor from the heat and warmth in the atmosphere. The competence of the technology to produce electricity to power the electric motor to convert the electrical energy into mechanical energy from the heat and warmth in the atmosphere makes the technology environmental friendly and helps in electric power vehicle to be purposeful and reach a wider range of audience without any practical difficulties.

Before we go further into the technology's functionality, it is important to see what sparked the concept of thermal energy conversion, what necessitated the concept and how flexible the technology can be to the user, manufacturer, and the environment.

4.4.1 ORIGINATION OF THE IDEA

The ideology of thermal energy conversion originated when the future of automobile industry started heading towards electric/battery powered hybrid engines for automobiles, to reduce the pollution rate in the ecosystem and protect the environment from heading towards a potential disaster of reduction in oxygen rate, increasing global warmth, imbalance in climate cycle, because of increasing pollution and potential fuel crisis.

The electric powered vehicles are the solution found by the manufacturers to stop the impacts of pollution, the manufacturers have already started to promote electric vehicles and reducing the production rate of internal combustion engine and stopping the production of the more pollutant diesel internal combustion engine except for the heavy-duty vehicles.

Further governments are emphasizing electric car sales by offering striking incentives for it that would upsurge the sales of electric vehicles. With electric powered engine taking over the automobiles including the sports car segment replacing the internal combustion engine can lead to a potential electricity crisis in the future when the electric engines are produced and sold in mass scale. The problem would be felt obvious especially in the countries where the current production of electricity is limited and sufficient to power domestic and commercial sectors. When thinking about the potential impacts that can be caused when the electric engine hits the main streams, inspired the thought of thermal energy conversion concept. The origination of the concept was sparked at that moment when I started to search for a solution that can possibly prevent from the impacts while upgrading the already near to perfect electric engines.

The thermal energy conversion technology was created with an intention to upgrade the electric engines and make them practical at any circumstances without any deficits.

The thermal energy conversion has been split into two phases, phase I consists and discusses on the thermal electric engine as the only source of a power plant, while the phase II consists both the thermal electric engine and the air boost engine as a duo engine concept and discusses on its functionality.

4.4.2 PHASE I THERMAL ENERGY CONVERSION

Phase I kit of the thermal energy technology discusses on how the thermal energy, can function as the only power plant to power an automobile. This proves that the thermal energy conversion can be the next step forward from the electric engines that are on sale right now. While the electric power to mechanical power conversion and the way the motor implementation to create momentum is similar to any electric vehicle, the method thermal energy conversion utilizes to generates electricity to charge the batteries is the vital difference.

While the thermal energy conversion technology is made to simplify and reduce the practical difficulties of an electric car, the functioning of the technology is simple and effective, the add-on cost for thermal electric energy is conserved to minimal as it uses minimal

components to function. The reason behind having the thermal energy conversion split into two phases is because the technology can be used as a single power plant as well as a dual engine concept that works alongside the air boost technology. The thermal energy conversion technology is flexible, and competent with its functionality.

Let see how the Phase I kit of the thermal energy motor works, and how it converts electric power to mechanical power to create constant momentum to move an automobile without any delay or lag.

4.4.3 HOW PHASE I OF THERMAL ENERGY CONVERSION WORKS

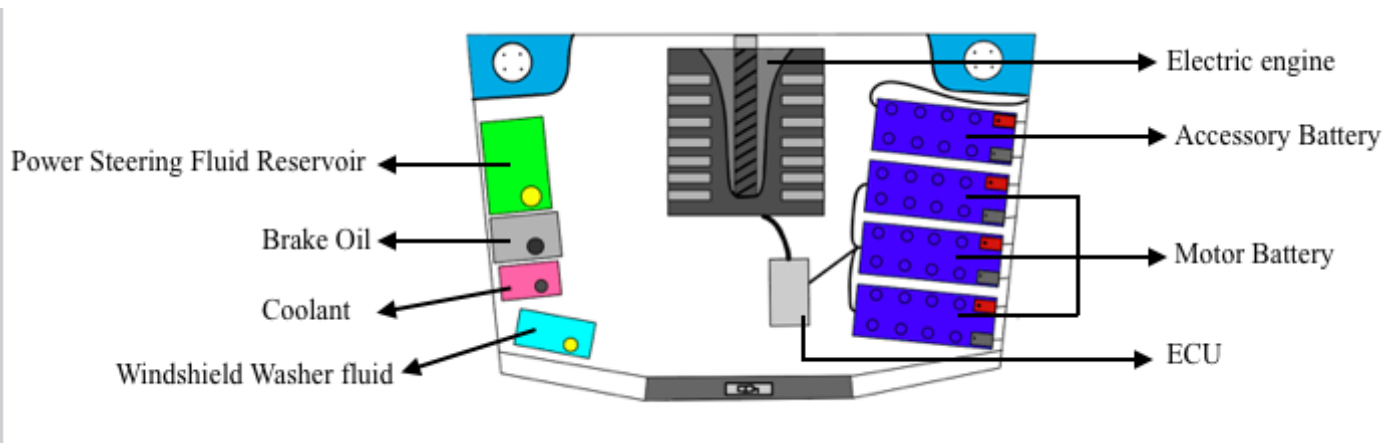
The phase I kit of the thermal energy technology functions by generating electricity by conducting heat and warmth from the atmospheric temperature and storing it in 4 distinctive batteries. The generated power is then sent to an electric motor which forces the motor to propel transforming the electric energy into mechanical energy. The belt driven propulsion of the motor generates adequate power and torque for an automobile, which is directed to the differential gear via drive shaft where the power is split by the differential gear to both the rear wheels depending on their traction and slippage via half shaft.

So this is the shorter description on how the phase I kit works, but now let's see how the phase I kit works in detail.

Before getting to the detailed description, let me explain the process of thermal energy technology functions through a step-by-step process.

1. Absorbs atmospheric heat
2. Converts the absorbed heat into electricity
3. Stores the electricity by charging the batteries

4. Electricity stored in the battery is dispensed to the electric motor via a stabilizer to avoid power fluctuation
5. The electric power forces the electric motor to propel converting the electrical energy to mechanical energy
6. Converted mechanical energy is sent to the wheels via a driveshaft



As described above, these are the steps that the technology goes through to produce power to create momentum for the automobile, but before getting to the brief explanation on the functionality of the technology, process the thermal energy technology goes through is described, to make it easy and better to understand.

- **HEAT ABSORPTION**
- **CONVERSION TO ELECTRICITY**
- **POWER STORAGE**
- **MECHANICAL ENERGY CONVERSION**
- **POWER IMPLEMENTATION**

4.4.3(a) HEAT ABSORPTION:

Absorption of atmospheric heat is the first step in the thermal energy conversion concept.

Regardless of the automobile's state of motion, the batteries will be charged until all four batteries are full. Heat from the atmosphere is absorbed using a medium that conducts and retains heat. The medium used for the absorption of heat can be any, provided it has good heat conducting and heat retention properties. This medium is placed on the exterior side that it faces and is in contact with the atmosphere.

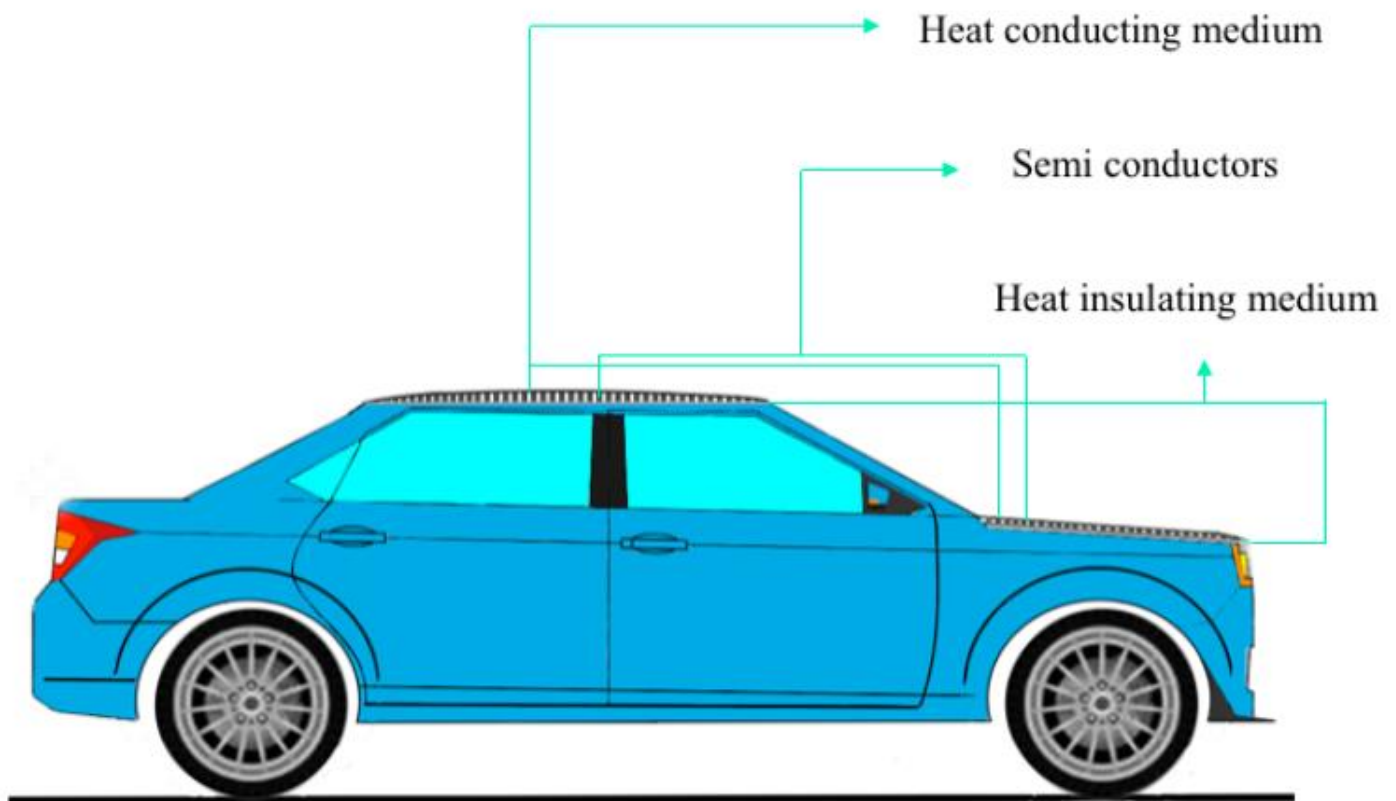
While the upper end (exterior side) is placed with heat absorbing medium, the lower end (interior side) is placed with heat insulating medium, like the heat absorption medium, the insulation medium also can be any provided it has good heat insulating properties unlike the criteria considered for choosing heat absorbing material.

4.4.3(b) CONVERSION TO ELECTRICITY

The absorbed heat will be transformed into electricity with the help of the semiconductors located between heat conducting medium and heat insulating medium. While the heat-conducting medium acts as the hot end, the heat-insulating medium placed below acts the cool end, the difference in temperature between both the ends creates electric energy. Coldness to the cool end is enabled through air conditioning system of the automobile and the unit placed in the hood is kept cool with the help of coolant running through it. With the extreme temperature difference on both ends of the semiconductors, the semiconducting cells start pushing heated electrons towards the cold electrons and since the energy of the electron surrounding the hotter end is greater than that of the cooler end, it starts moving faster than the electrons on the cool end, This makes the electron on the hot end move faster towards the cold compared to the cold electrons move towards the hot end, which eventually gets converted into electricity and the phenomenon is called as the thermoelectric effect.

Connecting semiconductors in uniform to form a cell in series within a battery will reduce the output because the wire connecting the cells will again be a metal that would produce voltage in the wrong direction opposed to the voltage that's originally produced by the cell, the solution to this is we use a combination that generates voltage using electrons and positive particles which in other words, can be said as "P-Type" and "N-Type" semiconductors. Placing cells in this

combination to form a series will help us create efficient voltage power without any loss in the transition as the one conductor that carries the electron will have the positive end on the hotter side and the negative end on the colder side, whereas the conductors that carry the positive particles will have the negative end on the hotter side and positive end on the colder side enabling us to connect the conductors in a series where there isn't any reversal voltage in the process of transition.



4.4.3(c) POWER STORAGE

The generated electricity reaches the battery to charge it. In total there are four batteries present inside the hood, three of it is dedicated to run the engine that produces the energy needed to power the vehicle, another one is dedicated to power the vehicle's accessories like the infotainment system, instrument cluster, map/reading lights, headlights, taillights, etc. The process of electricity conversion and power storage continues until all the batteries are completely charged. Whether the vehicle is being driven or parked till all four batteries are completely charged, the process continues. When the atmospheric condition isn't sufficient to

generate needed thermal energy conversion, the energy produced from brake energy recuperation and deceleration regeneration helps in charging the battery, it can also be used as an support to charge the batteries faster while driving which will further reduce the issue of power shortage making long-distance travel in an electric car equipped with the thermal energy conversion hassle free.

4.4.3(d) MECHANICAL ENERGY CONVERSION

Once the vehicle is switched on and throttle is applied the power gets supplied from the battery to the electric motor via a power stabilizer to avoid any power fluctuation that otherwise might kill the electric motor. Once the electricity reaches the electric motor, the electricity forces the motor to propel converting the electrical energy into mechanical energy. Power dispenses from the battery depending on the pressure applied on the throttle, the power delivery increases and decreases forcing the electric motor to propel faster and slower which helps produce sufficient mechanical power to move the vehicle efficiently.

4.4.3(e) POWER IMPLEMENTATION

Once the electric motor converts electrical energy into mechanical energy, the power produced is transferred to the drive shaft via a gearless transmission without any other interference. The power is sent to a differential gear where the power is dispensed to the wheels depending on the traction and slippage of the wheel in such a way that the automobile is powered efficiently without any wastage. The differential gear helps in splitting the power to the wheels and directing it to the surface effectively.

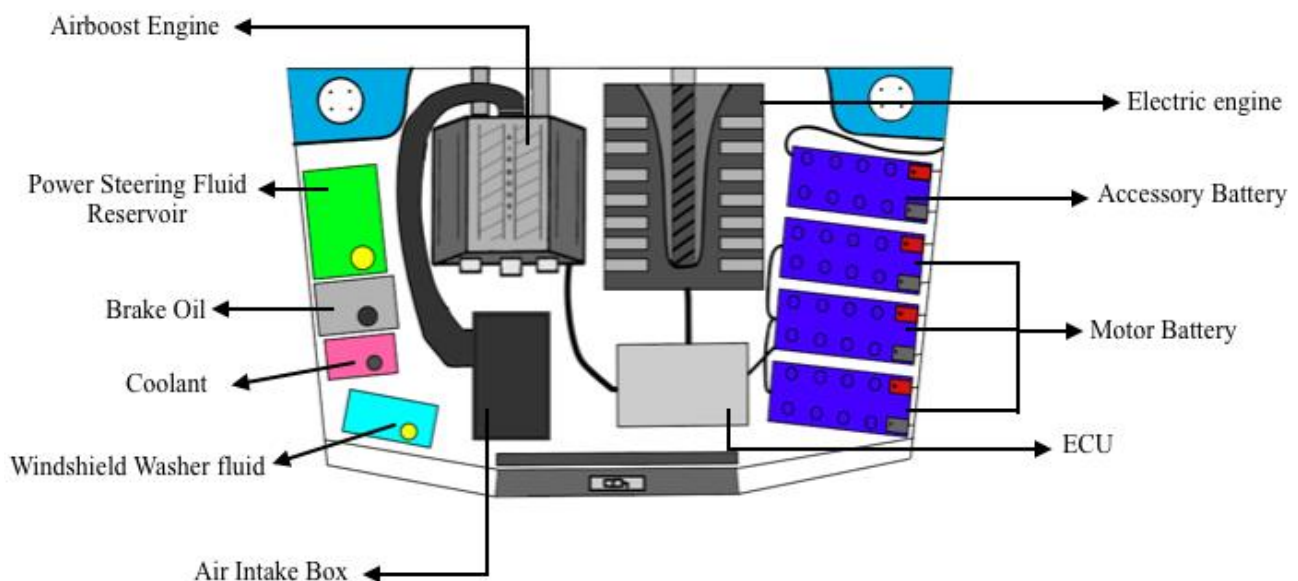
This is how the phase I kit of the thermal energy conversion works, and because the technology uses minimal parts, constructing an automobile with this technology can be cost-effective helping it reach a wider set of audience, making the electric powered vehicles and upgradation of traditional automobiles to electric engines more practical and efficient spectrum.

4.4.4 PHASE II OF THERMAL ENERGY CONVERSION

Phase II of thermal energy conversion discusses on how it functions with air boost technology. Again this is achieved with the help of the duo engine concept. The thermal energy engine is more than capacious to function an automobile on its own, but in a circumstance where there's a requirement for more power, or in an unexpected situation that necessitates another engine to ease and relieve stress of the thermal energy engine, the secondary power plant comes to the rescue. The Phase II discusses on how the thermal energy technology can function with another engine implanted with it in the same automobile.

4.4.5 HOW PHASE II DIFFERENTIATES FROM PHASE I

Phase II differentiates itself from phase I by using two engines to power one vehicle, that enables the user to choose which engine to use according to existing circumstances. This is accomplished with the help of duo engine concept, phase II uses the thermal energy electric engine and air boost engine as its two power plants to produce power and torque. With the help of the engine mode selector, the user is enabled to choose between the engines. The engine mode selector of thermal energy's phase II additionally enables the user to select a combination of both the engine's performance in needed percentage that comes under the third mode, "Custom mode". Here, the user can set as in how many percentage of each engine's output is desired as the total output performance of the automobile. All these differences mentioned make phase II of the thermal energy conversion technology significantly different from phase I.



4.4.6 HOW PHASE II OF THERMAL ENERGY CONVERSION WORKS

The phase II of the thermal energy conversion works by allowing the user to choose which engine to power the automobile. Though the process of how the thermal energy engine and air boost engine functions is the same as what has been already discussed, the process of activation, deactivation and optimization with respect to this duo-engine combination and concept is detailed here. Firstly, let us take a look at the process step-by-step.

STEP-BY-STEP

1. The automobile being powered by the electric engine, the user selects the air boost engine through the engine mode selector.
2. Battery deactivates power distribution to the electric motor and redirects the power to the air boost engine to start the air intake process.
3. Once the air boost engine starts its power production the power is sent to the drive shaft.
4. The power gets distributed to the wheels with the help of differential gear.
5. Once the user switches the engine mode back to thermal electric engine, the power distributed to the air boost engine gets disconnected.
6. The battery starts powering the electric motor again.

These are the steps involved in phase II of the thermal electric engine, in-order to gain better understanding on how the technology functions, let me split the process into 4 titles.

- **ENGINE SWITCH**
- **POWER DELIVERY**
- **POWER OPTIMISATION**
- **REVERSAL**

4.4.6(a) ENGINE SWITCH

Engine switch occurs with the help of engine mode selector feature located on the instrument cluster of the automobile. The user can choose between the engine option using this selector found in the instrument cluster that is easily accessible by the user. The engine mode selector contains three modes, (i) air boost engine, (ii) thermal energy engine and (iii) custom mode. When the air boost engine is selected the battery deactivates the power supply sent to the thermal engine and starts to supply power to run the air boost engine, when the thermal electric engine is selected the power supply sent to the air boost engine gets deactivated and the supply is sent to the thermal engine to produce power. While the mode is set to the custom mode, the engine mode feature allows the user to optimize the power production level of both the engine at the same time in desired percentage. Here, the supply is sent both to the air boost engine and thermal electric engine.

4.4.6(b) POWER DELIVERY

Once the electricity reaches the air boost motor, the air intake process begins. As the process of power production in the air boost engine starts, the generated power is transmitted to the driveshaft via gearless transmission. The driveshaft transfers the power to the differential gear from where the power is split to the wheels depending on their traction and slippage to put down the power effectively via half shafts.

4.4.6(c) POWER OPTIMISATION

The power optimization is the third mode available in the engine selector, which is displayed as the custom mode. This feature helps run both the engines at the same time, this feature allows the user to optimize both the engine's power production level in a percentage spectrum. This allows every car equipped with the duo engine technology to drive different from one another, and it further allows the user of the vehicle to exactly tune the engine like the way they want. This increases the versatility and flexibility perspective of the technology.

4.4.6(d) REVERSAL

Reversal, in which when the motorist prefers to use the thermal energy electric engine to power the automobile, the electricity power sent to the air boost engine gets deactivated and the electricity is sent back to the electric motor, from there onwards the power generation and power implementation process is the same as the phase I of the thermal energy conversion technology.

This is how the phase II of the thermal energy conversion works. Phase II further increases automobile's versatility with its power optimization feature enabling every automobile powered by the same technology to be unique according to the user's preference. The thermal energy engine combined with the air boost engine is the perfect combination that showcases eco-friendly concept without sacrificing on performance of an automobile. The concept of thermal energy conversion takes the electric car and electric motors to another spectrum in which all the practical difficulties faced by an electric car on a day-to-day basis is addressed and resolved. By employing the technology of thermal energy conversion, the doubts and concerns that restricts buyers from getting an electric automobile can be subdued, the common worry for anyone on buying electric cars is that it cannot be taken on long trips because of the low battery range and the longer charging duration.

4.4.7 WHY THERMAL ENERGY CONVERSION

Thermal energy conversion was designed to support electric motor car segment to overcome the points stated as its disadvantage. As the world and the automobile industry is evolving towards, eco-friendly, pollution free and go green concept, researches are being done on cars and electric motors, that would enable internal combustion engine to be converted into electric powered automobile. But, converting ICEs to electric engine isn't a long standing solution as mass production of electric engine would again lead to many problems like large quantity of ore extraction for battery production, energy deficiency, lack of or insufficient support to power electric engine. Thermal energy concept was introduced as a resolution technology that would solidly support the roll out of electric vehicles. This concept generates electricity by absorbing and converting heat in the atmosphere to charge the batteries. By implementing this concept, it helps to convert the heat contained in the atmosphere into a useful

form of energy that not only resolves the issue of energy deficiency but also reduces the warmth in the atmosphere, which is being the main cause for climate change and global warming. This concept can be implanted in any automobile that is being powered by electric motors. Quicker reach of this technology amongst the automobile industry, helps us to achieve the benefits swiftly.

The vehicle will produce electricity needed to power itself, this technology is further convincing as the battery keeps charging while the car is on the move which increases the use of electric vehicles. While going on a road trip, this technology can be really convenient as it eliminates the need of pulling over at a power station to recharge the batteries. Introducing this technology in the automobile industry can be beneficial not only from the manufacturer's perspective but it is also beneficial from the consumer's and government's perspective. Technology being introduced in an automobile increases the long-term ownership of an automobile, ensuring the trust on the automakers, the technology benefits the consumers by saving up money spent on electricity bills. It reduces the overall hassle of automobile maintenance for the consumers because the technology generates its power from the atmospheric heat. It helps in reducing the effects of global warming and stabilizing the climate, which is something that the government is focused on achieving in the near future. It also reduces the risk of having electricity crisis in the future when electric powered cars hit the mainstream mass market. Electric cars concept is nothing to complain, this technology concept only endorses the means to generate energy source to power electric motor without being struck with problems in future, after expanding the market by preventing the predictable issue of electricity scarcity.

These are the reasons that made me design this technology, the impact that this concept could create when it hits the market can be valuable. This concept helps in making the electric car concept more practical and affordable around the world with enhancing the longevity of the technology. The benefits that can be achieved by this technology are vast. It is a practically implementable concept. The government is keen towards making ecological cars and switching to electric vehicles for the future and the government is funding the automakers for the R&D purposes of electric vehicles, in this case the thermal energy conversion technology can be a progressive evolution in the electric car segment.

4.5 GEARLESS TRANSMISSION

Gearless transmission is a technology that removes the geared transmission from a traditional automobile. The gearless transmission brings in a less intricate automobile to the society. Removing the geared transmission from the traditional ICE's power implementation process reduces

- (i) The weight of an automobile,
- (ii) Production cost of an automobile and
- (iii) Complexities in driving an automobile.

With the future heading towards automation, in order to provide comfort and convenience to the consumers, features and technologies are made to look simpler and fanciful making the process involving the feature's functioning go complex and problematic. To bring in the idea autonomous driving to reality, efforts are being made by industry to offer vehicles with various different geared range automatic transmission starting from 6 speed to 10 speed automatic transmissions that would function through different technologies like torque conversion, continuously variable transmission (CVT) and dual clutch transmission (DCT). The goal here is to offer comfort and convenience to the customers without compromising on the objective upon which the vehicles are built. In this timeline, where both the consumers and manufacturers are heading towards an automobile that is easy to use, gearless transmission further fulfills and upgrades the agenda.

4.5.1 ORIGINATION OF THE IDEA

The origination of gearless transmission occurred when I realized the mindset of the mass audience expecting an automobile to be easy to maintain and drive. While manufacturers are heading in the same route to offer their range of automobiles as easy to drive as possible, having a routine and traditional line of transmission process that's suited for a manual automobile in an automatic version feels strange and pointless. Eliminating the traditional geared transmission can be productive for the manufacturers in making their automobiles lighter, cost-effective, and

equip their product to perform better. While thinking about the prospects that could be achieved by reducing a geared transmission originated the thought of gearless transmission.

4.5.2 HOW GEARLESS TRANSMISSION WORKS

Gearless transmission is a very modest technology to be executed. While the idea behind designing this technology is to make driving cars easier simultaneously reducing the cost and weight of an automobile. Transmission contributes considerable amount of weight to the automobile's total weight, the weight of transmission can vary anywhere from 75 - 300 Pounds (34 - 136 Kg) depending on the gears and transmission itself. Reduction in weight of an automobile can result in achieving better fuel efficiency, better performance with significantly smaller displacement engine and effortless driving. Reduction in the production cost of an automobile can be beneficial to both the manufacturer and the consumer. But how does the gearless transmission work? Before getting into detail, let us take a look at the process step-by-step.

STEP-BY-STEP

- Once the engine is started, flicking the forward paddle placed behind the steering, the car is set to move forward.
- Generated power is transmitted to the drive shaft without any other interference.
- The drive shaft transfers the power to the differential gear.
- The differential gear splits the power to the half shafts.
- The half shafts transmit the power to the wheels.

As described above the gearless transmission technology is the simplest yet efficient technology. The gearless transmission goes through 3 processes to implement the power to the surface.

1. DIRECTION ENGAGEMENT

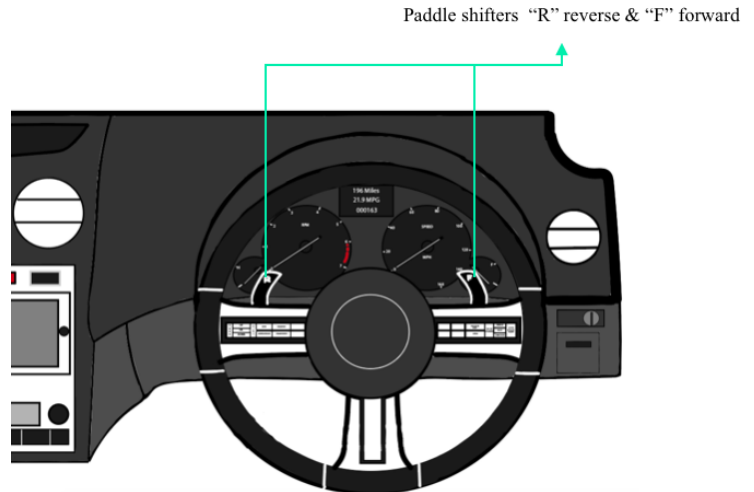
2. POWER TRANSFER

3. POWER IMPLEMENTATION

4.5.2(a) DIRECTION ENGAGEMENT

Once the engine is cranked, the direction that the automobile is to move is engaged by flicking the paddle buttons placed on the sides of the steering wheel. Paddle positioned on the right is to move forward while the paddle positioned on the left is for reverse. Just by clicking either one of the paddles desired by the user, the command is transferred to the ECU. The

ECU engages the differential gear to propel in order to produce momentum for the automobile in the desired direction.



4.5.2(b) POWER TRANSFER

The power generated by the engine is transferred to the driveshaft, which forces the drive shaft to propel. The propulsion of the drive shaft helps transfer the generated power and torque to the differential gear. The driveshaft connects the engine and the differential gear, it works as the medium to carry and transfer the power. The propulsion of the driveshaft causes the differential gears to propel as well.

4.5.2(c) POWER IMPLEMENTATION

The differential gear is the supply train in this process. Differential gear holds an important position in the gearless technology. Here, the rotation of the drive shaft is connected to the differential gear. The propulsion of the driveshaft is divided and distributed to two other shafts which are called the 'half shafts'. Like how the drive shafts connects the engine and differential gear and transfers power from one to another, the half shafts connects the differential gear and

the wheels and transfers the divided power to the wheels which moves the vehicle. The differential gear is an arrangement of gears that allows to divide the power received from the engine equally to the wheels and when the automobile is being driven on a straight line the differential gear helps in keeping the wheels at the same speed. But while at the corners when the automobile is to take a turn, the differential gears help in spinning the outer wheel that needs to cover a farther distance to rotate faster than the inner wheel. The differential gear is used for the same reason to transfer the power received from the engine to the wheels equally depending on their traction level ensuring that the power produced by the engine is used effectively.

By using different gear ratio in the differential gear, the vehicle power implementation method, the duration and longevity of an engine's RPM can be modified. This makes the gearless transmission extremely flexible to any situation it's thrown to. Because the gearless transmission uses no gear, using a lower numerical gear ratio, the revolution per minute extends helping to achieve better fuel efficiency, better longevity of power band retention and high top speed. While, higher numerical gear ratio helps to achieve faster acceleration and instant sensation of acceleration.

Implementation of this technology can lead to a more efficient and productive automobiles. The gearless transmission interface is kept simple to make it user-friendly. Reduction of components results in less production cost, this increases the affordability perspective and increasing the sales of automobiles. As this technology simplifies the driving process, it widens the range of audience.

4.5.3 WHY GEARLESS TRANSMISSION:

The concept of the technology is to basically eliminate the transmission component from a vehicle, as consumers started choosing automatic transmission over manual transmission due to its ease in driving in the increased traffic and to reduce the struggle of learning how to drive a manual transmission. Every car manufacturers have started introducing automatic transmission as a priority transmission option over the manual in every model they offer. Even the manufacturers who had not been offering an automatic transmission have started to offer due to

the popular demand of it amongst the consumers. And the manual transmission has now become a secondary option amongst the consumers while choosing a transmission. Due to increased popularity for automatic transmission amongst the public, car manufacturers have been researching on introducing an economical and well performing automatic transmission in their product line. At present there are multiple options of automatic transmission on offer for the carmaker to choose from each depending on the segment and the audience the car is targeted towards and the performance the car is aimed to achieve.

Ranging from the economical AMT (Automated Manual Transmission), CVT (Continuously Variable Transmission), torque converter transmission, to a more upmarket performance oriented DCT (Dual Clutch Transmission), all these variants of automatic transmission are available for the manufacturers to include in their product according to their needs. This concept further simplifies the process by removing the gears and the transmission line itself enabling a complex free and uncomplicated driving mechanism for the public. Reduction of weight contributed by the removal of transmission line from the traditional architecture of the automobile can translate into better fuel efficiency, better top speed, reduction in overall production cost and a hassle-free driving experience.

Removal of transmission line from the automobile reduces the pedal from ABC to just A & B where the user just needs to concentrate on the road clearance and maneuver the vehicle through brake and accelerator pedal. Removing transmission from an automobile can be difficult to think off, but is practical and makes the overall driving mechanism simple and easy to explain and work with. The gearless transmission can be implemented in performance vehicles too. Manufacturers offering best performance car at present use variations in gear ratio to achieve best performance figure in their product line, the same concept is integrated in gearless transmission where the difference is that, the entire transmission system is replaced just with differential gear. Here, in gearless transmission, higher numerical gear ratio of the differential gear enables faster acceleration and quick response of acceleration engagement, while, lower numerical gear ratio enables top speed, increased RPM band and best fuel efficiency.

Gearless transmission not only allows the manufacturer to configure their product's driving characteristics by changing the differential gear ratio but it also allows the consumers to modify their car's gear ratio (differential gear) allowing them to configure their car's driving characteristic for their own specification and preference which makes every automobile unique enabling the consumer a sense of being exclusive and distinct.

The gearless transmission concept is practically implementable, though this book only elaborates the concept/technologies from a design and architecture outlook, research with respect to the science and engineering perspective needs to be done by the manufacturers to perfectly implement the technology in their product depending upon their product's feature (shape and weight) and characteristics (driving performance and purpose).

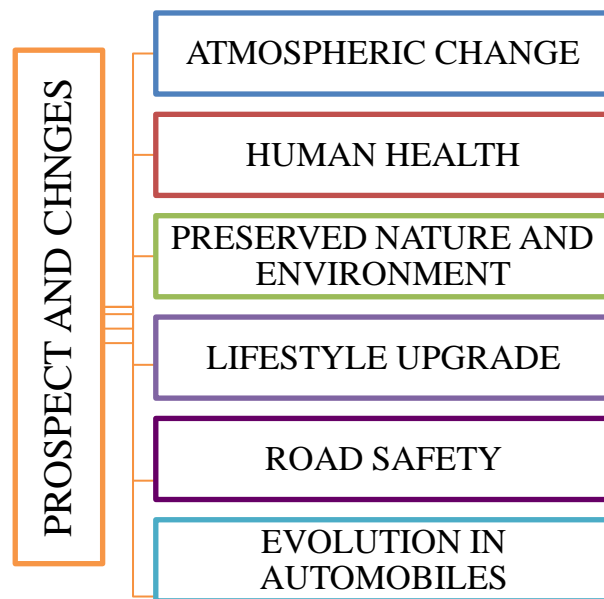
These are the five technologies that I've designed to propose as the solution for problems existing in and around the automobile industries and their products. And as the functionality of the technologies has been explained, the next chapter focuses on the prospects and changes that these technologies would bring to the society, automobile industry, and the environment.

CHAPTER V - PROSPECTS AND CHANGES

This chapter discusses on the prospects and changes that can be brought to the society, automobile industry and environment, by presenting the technologies (Air boost, duo-engine, flying car, anti-fire, thermal energy and gearless transmission) deliberated in this book as the solution for the automotive industry and future of automobiles. The functionality of these technologies has been explained briefly and the benefits that can be availed by employing have also been touched in the same chapter. But this chapter discusses on what are the benefits and changes that can be availed by implementing the technologies, briefly. All the mentioned technologies were designed to make automobiles safer, trustworthy and sustainable. But what could be the actual changes that can be found by using them, in reality, is what the chapter of prospects and changes it to talk about.

The prospects and changes of the technologies have been mentioned together and been

categorized into four headings as most of the technologies prospects are common to be ecological, lessening the complications and progression in technologies and automobile. and the technologies prospects that fall under the category of the title will be explained in it. Prospects and changes is the final chapter before the conclusion, the chapter is as important as the previous chapter that described on why and how the technologies work, as it describes what are the changes it can make and the prospects that are brought with it.



5.1 ATMOSPHERIC CHANGE

Atmospheric change is one of the most common prospects of technologies like the air boost and thermal energy conversion while these two technology's that emphasizes its atmospheric change prospects, technology like the gearless transmission does make changes to the automobile's traditional set-up that it secretly contributes with the atmospheric change. While the prospect and change that both the air boost and thermal energy engine causes are the same, But the route they take to attain the prospect of them varies.

While the air boost engine achieves its atmospheric changing aspect by avoiding the usage of fuel to produce power and torque to move the automobile, by avoiding the usage of fuel it also avoids the combustion process of an internal combustion engine that creates pollutant particles and heat which is mixed in the atmosphere increasing the global warming and creating an imbalance in the climate cycle, due to the heat exhausted from the automobiles causes increase

in temperature. By consuming polluted air as intake from the atmosphere the air boost engine pressurizes the air and produces power and torque to generate momentum for the automobile additionally the air that was taken in to produce power goes through two stages of filtration process one before entering the air boost engine and one after exiting the engine before being exhausted which purifies the air removing pollutants from the air increasing oxygen content in the atmosphere to breath.

When the air boost engine is implanted in the daily driving automobiles segment, vehicles become more efficient and eco-friendly purifying air, reducing the internal combustion engine usage ratio resulting in a reduction of heat in temperature and global warming, creating a change in the atmosphere.

While the thermal energy conversion technology, achieves the atmospheric change aspect by the method it generates electricity to power the electric motor to produce momentum to move the automobile, as said before the power production of an electric motor is similar to what exists in the present but what makes the thermal energy conversion technology special is how it generates electricity to charge the batteries to power the electric motor. Normally an electric car that exists uses a plug-in system to primarily charge the batteries, but the thermal energy conversion absorbs the heat and warmth in the atmospheric temperature which then is converted into electricity to power the battery, when the heat is absorbed from the atmosphere it reduces the heat in temperature and global warming effect, stabilizing the climatic cycle.

Gearless transmission's contribution to the atmospheric change is minuscule, as it helps achieve the aspect by reducing the transmission from the vehicle, By reducing the transmission from an automobile it helps in making an automobile lighter, a smaller capacity engine can be used, compared to a vehicle of same size with a transmission.

It also increases the fuel efficiency by using a lower numerical ratio differential gear, which permits to accomplish higher top speeds while keeping the engine RPM relatively low, which helps to achieve better fuel efficiency. When an automobile is fuel-efficient it consumes less fuel, reducing its pollution factor, which helps the gearless transmission achieve the

atmospheric change aspect.

5.2 HUMAN HEALTH

Human health, is one of the major impacts that's caused by excessive use of internal combustion engine, with the increase in vehicle population the pollution in the atmosphere has increased, due to the mixture of the pollutant toxic particles with the oxygen that we breathe in, it causes health concerns like asthma and other respiratory related issues, a scientific research exposed to polluted area even an healthy persons lungs seemed to have decreased its function and suffered respiratory issues.

Breathing polluted air causes damage to the immune system and other reproductive systems in our body, living in a highly pollutant rate areas can cause higher heart-related problems. In order to resolve this worsening issues government and car manufacturers are working on developing the most pollution free internal combustion engines and electric hybrid cars, for the upcoming future of automobiles being ecological, the technologies of mine like the air boost and thermal energy conversion helps achieve the expected results to be ecological, while the manufacturers are developing technologies that prevent upcoming automobiles to be from highly polluting the environment. Implementing both my technologies into upcoming automobiles helps restore the atmosphere where it used to be.

As the air boost engine uses air that prevails in the atmosphere to produce energy it uses no fuel to pollute the environment, While the air consumed is purified in the power production process which removes all the pollutant particles from the polluted air relapsing them back to normalcy , by air boost technology purifying the air, it also helps in retaining high power, cylinders and displacement internal combustion engines in production for the sports car and heavy duty segments, that satisfies the automobile driving enthusiast that prefer to have a gasoline engine powered automobile, while the air boost engine takes upon the responsibility of preserving the oxygen and reducing the pollutants from the air, by powering the mass produced daily driven automobiles segments. Which makes the air boost technology to accomplish its prospect and bring the change in the air that humans consume for a healthy living.

While thermal energy conversion technology uses its electricity production process as its lead to preserve the society, as described above in the atmospheric change, the thermal energy conversion technology produces electricity by absorbing heat and warmth from the atmosphere, while this has been discussed in the previously, the answer was focused more towards how it helps to change the atmosphere, but this discusses how the same process helps in betterment of human health. By generating electricity from absorbing the heat and warmth from the atmosphere, it reduces the heat in temperature. High heat in temperature can cause issues to human's day-to-day life like, excessive sweating, dehydration, heat stroke and etc.

Passenger automobiles primarily contribute to global warming by producing greenhouse gases, producing greenhouse effect traps heat waves causing global warming and creating hotter temperatures. By using thermal energy conversion technology, the heat and warmth in the atmosphere is being absorbed to produce energy and as the technology keeps producing electricity from the heat in the climate even then the vehicle is parked till that batteries are completely charged, it reduces the global warming effect and the heat waves, bringing the temperature down to its normal state, and stabilizing the climate change process from the fluctuation it's at now. When the climate gets warmer it causes a change in its global rainfall, evaporation process, snowing and water stream, which impacts on water supply and the water quality, when a water gets warmer it affects it's quality and increases its pollution, Which also affects health of human and other species in the food chain. By reducing the global warming effect, everything relapses back to its originality and that helps thermal energy conversion technology bring a change to human's health and make its prospective aspect.

Thermal Energy conversion and air boost engine technology are the two primary technology that was designed to prevent the possible mishaps from occurring due to automobiles and revert the issues that are already raised by automobiles. While the other technologies focus on other perspectives of making simpler automobile mechanism to function and making them safer than before, for the evolution of automobiles which is one of the titles that are to be discussed.

5.3 PRESERVED NATURE & ENVIRONMENT

Preserving nature and environment is one of the major prospects of technologies like air boost technology, thermal energy conversion, and flying car mechanism. These three technology focuses on preserving and improving the nature, greeneries and natural landscapes from being destroyed for/by automobiles. But like always all three technologies take a different route to achieve the goal to save the nature and environment.

Air boost technology, because it purifies air in the process of producing power it helps in increasing a pure and oxygenated content and reduce toxic pollutant and greenhouse particles in the atmosphere and water for the plants and trees to consume to reproduce themselves to create naturally healthy nutritious vegetables and fruits for the humans and animals to consume, improving the overall healthier food chain. It can help the entire food chain to be more healthy which helps humans to consume products from the food chain be more healthy for instance Milk, Meat, Eggs, and Etc. The positive impacts caused by implementing the air boost technology is affluent, the air boost being the primary technology of all the five technologies it has the most of all prospects and changes that can be brought into the society, automobiles and the environment. By reducing the pollutant and toxic contents from the air, and making the air pure and healthy to breathe and consume, the air boost technology achieves its goal to preserve and rebuild the nature and the environment for the better.

The thermal energy conversion technology achieves its capability to preserve the nature and environment by reducing the global warming and greenhouse effect from the climate when the heat is reduced from the atmosphere it leads to the climate change cycle to stabilize.

When the climate change occurs by the time it should the plants growth and farming will improve causing the food reproduction to increase and stabiles natural infrastructure of the country from crisis on any food ingredient, when the natural wealth grows in a country, it automatically produces purer air at the right consistency and provide significantly a lower climatic temperature.

When the global warming decreases, it automatically reduces the greenhouse effect and toxic pollutants in the atmosphere avoiding multiple destructive calamities like acidic rain which not only deteriorates the nutritious value of the plants and veggies but also the food chain that consumes them which finally lead to affecting human health when the animals in the food chain are consumed by us.

By absorbing the heat in the atmosphere the technology reduces the global warming and greenhouse effect which protects and preserves the nature and the environment, which makes the thermal energy conversion technology to be one of the key technologies to reduce and prevent the disasters that could have because of automobiles

The flying car mechanism is the technology that largely helps to preserve the nature and the environment overall looking through all the five technologies, the flying car mechanism reduces the destructions caused to natural landscapes by increasing soil stability, while this nature preserving aspect of the flying car mechanism has been touched on in my explanation on why the flying car mechanism was designed. But the flying car mechanism is a technology that uses its flying competency to create space for accommodation of automobiles in the future, with the increasing traffic the government is planning on widening and building new road infrastructures, in the process the road expansion is taken into the wildlife area occupying their living space and destroying the landscapes that were created by nature, which reduces the soil rigidity.

With the implementation of flying car mechanism, the road infrastructure that's at present is sufficient to accommodate the automobiles in the future and prevents road broadening process that intrudes into nature and wildlife. It also shrinks time wasted on traffic and saves money for the government that invests on developing road infrastructure. The impacts that can cause by encroaching the wildlife can be humongous, it can cause frequent encounter with the wildlife animals, and the stress and pain caused to the wildlife when it is encountered in the urban areas in the process of expansion can be immense.

With the introduction of the flying car mechanism, it allows the humanity to enjoy the best of both worlds, availing their automobiles yet not being destructive towards nature and the environment, with this flying feature the flying car mechanism achieves its prospect of preserving the nature and the environment.

5.4 LIFESTYLE UPGRADE

The technologies that I've designed is not only to change and protect the nature and environment but also supports in upgrading the lifestyle of the people in the society. The air boost, flying car mechanism, gearless transmission and the thermal energy conversion all the four of five technologies help in upgrading the lifestyle of the people in the country that helps gain better reputation for the country. While the way these technologies achieve its prospect is similar the technologies lessens the parts used to function compared to its counterparts which makes it cost effective in terms of production cost, when an automobile's production cost is minimized compared to its counterpart it becomes easy for the manufacturer to price the automobile for the consumers attractively. Though the change the technologies make to achieve its goal to be helpful in upgrading lifestyle the route it takes is different.

Air boost technology reaches its motive of being cost-effective and help change the lifestyle of the citizens of the country for the better. It reduces the parts from the engine to reduce the production cost of the vehicle compared to its counterpart the internal combustion engine, an internal combustion uses pistons, fuel injectors, spark plugs, crank shaft, cam shaft, connecting rods, intake manifold, exhaust manifold, valve springs, fuel pump, water pump and etc. to function and produce power while the air boost engine uses only a pair of supporting propellers, a pair of upper propellers, a pair of lower propellers and a straight exhaust pipe layout to function which reduces weight for the vehicle and allows manufacturers to use better quality materials in automobiles that are commonly used in a segment above vehicle that is powered by an internal combustion engine.

Due to the substantial reduction in usage of components with the air boost engine, it reduces the weight of a vehicle allowing the air boost engine to function better, by reducing the

parts used in an automobile using the air boost engine, the automobiles become more affordable and cost-effective to manufacture when produced in a larger scale. The reduced production cost translates into an attractively priced affordable automobiles for the public, increasing the accessibility of automobiles for the public which encourages more people to upgrade from motorcycles to a car, garnering sales for the manufacturers, and enhancing the lifestyle for the citizens of a country.

Flying car mechanism itself is a step forward from any mainstream automobile that everyone is allowed to drive, with its capability to fly keeping the procedure to flying relatively similar to a car that drives on the surface, makes the technology more attractive. Without complicating the operation of the flying car mechanism and its capability to also drive on the surface like any other automobile increases its adaptability perception. As cab firms are in the development process of building a cab service that takes people on air to their desired destination saving time wasted on traffic, this technology allows the manufacturers to make vehicles that can fly which can not only available for the cab firms but also for any consumers that desires to own one, owning flying car and a country that has cars flying around taking people from point A to point B would be the next step forward which makes the flying car mechanism accomplish its prospect of upgrading the lifestyle of the citizens of countries around the world.

The gearless transmission is a technology that seems to be a simple technology but its prospects are it also helps in upgrading lifestyle of the consumers by simplifying the mechanism of an automobile's functionality, though the people are seeing the prospects of owning and driving a car around instead of motorcycle, There are people who still think it's expensive to afford a car and the mechanism to drive a car is clumsy and can be cumbersome to drive in bumper to bumper city traffic on a daily basis.

But with the gearless transmission the cars become more affordable as it reduces the cost of buying and planting a transmission in the production of a vehicle, this helps manufacturers to price the vehicle attractively and reduce the need to shift through gears and having to repetitively put the car on drive, neutral, park and reverse is reduced with this gearless transmission.

The only physical operation the gearless transmission requires is for the driver to click the paddles to define the direction of the vehicles movement the rest is left to the vehicle itself, once the car gets to a halt the gearless transmission instinctively engages the brakes to hold the vehicle in place, once the vehicle is set to move again by pressing the brake pedal twice the system releases the brakes. Which simplifies the process it takes to drive an automobile all these prospects lead to encouraging more people to upgrade from motorcycles to cars, which boosts the sales of cars yet upgrading the lifestyle structure of the people in countries around the world.

5.5 ROAD SAFETY

Road Safety is one of the common prospects and the change the technologies would bring to the automobiles and to the society, technologies like the anti-fire technology, gearless transmission and the flying car mechanism are made to make the roadways, automobiles, pedestrians feel securer to access or function, but again each technology succeeds its objective to change and upgrade the road safety for the better differently.

Anti-fire technology's prospect is that it helps avoid the incidence of fire accidents, the technology is made to prevent and protect automobiles and the passengers from a fatal fire accident. It uses its technology of extinguishing the fire at a very early stage before it enrages into a huge accident. By intimating the passengers with a audible warning that a specific part of the automobile is overheating abnormally and unlocks and rolls down the windows, advising the passengers to pull over and hop off the vehicle, while it extinguishes the fire, by this action the technology manages to save lives from danger, while still trying to set off the fire, once the automobile finds itself in a halt, it automatically starts the process to spray foam water mixture on the vehicle to set off the fire further deactivating the power supply from the battery to avoid short circuit issue, this technology helps avoid huge damages from transpiring in-case of an fire accident it helps save the automobile with very minimal damage and saving the occupants without injuries, Once the technologies rectifies the issues it also intimates the owners with the status vehicles, at with a report on the intensity of the damage, where it occurred and is the vehicle drivable or needs an examination by the service stations for safety.

This helps in making automobile safer than before which is the motive the manufacturers are endeavoring to achieve with their modern and future automobiles.

This technology further increases the safety aspect of an automobile building confidence and trust with consumers in operating the automobile. As safer the automobile gets the consumers trust with the manufacturers to increase the opportunity of future purchases from the same consumers. This makes the anti-fire technology to accomplish its prospect to change the automobiles to be safer, making it road safety.

Gearless transmission helps making the road safer by reducing its process to drive an automobile, for a person to drive an automobile in the present can be strenuous where the other drivers on the road can be reckless with their driving habit this requires more attention on the road, for a person who is clumsy drive an automobile that contains multiple processes to drive can be stressful, and makes it easy on getting distracted from the road, this can be dangerous for the drivers on the road and for the pedestrians as there is a high chance of the vehicle to swerve of the lane hitting the cars on the road or ignoring the red signal running into a pedestrian due to lack of concentration. Elsewhere vehicle using the gearless transmission the process to drive an automobile is made simpler which allows the driver to focus on the road and avoid distraction, which makes the roadways safer. By simplifying the complications in driving, the gearless transmission increases the ease in driving an automobile and pay due attention on the road without any distraction caused by the automobiles, which helps the gearless transmission achieves its prospect to change the road to be safer.

Flying car mechanism uses its flying capability to increase road safety. Most accidents occur in recent days because of the clumsy traffic and the roadways being incapable of accommodating the increasing vehicle population and lack of parking spots in peak traffic areas in metropolitan cities. By using the flying car mechanism in the automobiles made in the future the issues can be rectified, the road can be much safer place, obviously flying an automobile is not an easy task but the simpler and near to the operations of driving an automobile on the surface makes the flying car mechanism's user interface easy to operate, also because the flying car mechanism uses the Bernoulli's principles to function, which also helps in reducing the weight

of the automobile by passing wind through the chambers places underneath the chassis creating a cushion effect, while allowing the crosswind to flow through the vehicle increasing the stability of the vehicle, making flying the flying mechanism less stressful and easy, this functions ability to also drive on the surface when preferred increases its flexibility and adaptability aspect of the technology, As described in the previous prospect “Lifestyle Upgrade”, the technology also helps accommodate the increasing vehicle population without having to invest millions on developing road infrastructure which leads to us intruding the wildlife, and destroying the nature and spoiling the environment. With its flying capability, the flying car mechanism achieves its prospect to create a change in road safety for the better.

5.6 EVOLUTION IN AUTOMOBILES

Evolution in automobiles, this is one prospect and change that all the five technologies can create by the application. Starting from air boost technology, flying car mechanism, anti-fire technology, thermal energy conversion to gearless transmission, all these technologies promote the automobiles to another level of being a safer, easier to use, affordable and proficient transport media. This evolution brings in car manufacturers more sales while still serving the ecosystem and society for the better, and reduce the intensity of the issues raised in the society because of automobiles. Just like every other prospect the technologies reach the prospect differently, some attains through design, some through its functionality and some through its cost of production.

Air boost technology succeeds its ability in evolution of automobiles by its functionality, cost of production and design, it's functionality shows how efficient of a power-plant air boost engine can be, it's totally a technology/concept that wasn't thought of before which helps in raising automobiles to a advanced spectrum, because the technology uses minimal parts compared to its counterpart engines, it can be extremely advantageous to automobile manufacturers when the air boost engine enters mass-produced models, and help them price attractively increasing its range of accessibility to the consumers, as far the design is concerned the technology carries a very simple layout, requires fewer parts to function the whole power production process contains minimal parts which shows that a technology can be advanced and unique while keeping the design simple and less complicated.

Flying car mechanism reaches its ability to evolve automobiles to a better place with its design and functionality aspect. This technology contains a futuristic concept and displays how it can be practical to reality with its design and functionality. As described above on how the flying car functions, Its obvious that the technology's mechanism is simple to understand and its just as easy to operate as it is to understand, which makes it's design functional, as the concept of flying car has a wow factor with it, the design focuses more towards being effective and efficiently functional, the design of flying car mechanism is extremely easy to operate which reduces the worries of a person to lose control of the automobile while flying, making a flying automobile easy and less intimidating to operate, this makes the flying car mechanism earn its aspect to evolve the automobiles to a better and advanced state.

While functionality of the flying car mechanism has been explained above briefly to understand, by reading through it functionality of the technology is extremely straightforward and doesn't involve any complication that adds the cost of effort in functioning. The user interface of the machine is remarkably easy to get used to, as it is the same as a vehicle driven on the surface. Which again helps the flying car mechanism achieve its prospect to evolve automobiles into a new spectrum where the technology and mechanism are advanced while it costs less to own and the user interface is less complicated.

The anti-fire technology takes on the evolution in automobiles by earning its capability to make automobiles safer than before while keeping the design near to simple with its cost-effectiveness. The anti-fire technology is one of the technology that help enhance the safety aspect of an automobile just like most of my other technologies the anti-fire technology is universal and can be used in any kind of transportation media with an modification depending on the transportation media. The design of it is simple and requires few additional parts over a normal automobile that isn't equipped with the anti-fire technology, with the reduced parts usage the automobiles production cost doesn't increase much making the technology cost effective, the benefits and changes that can be brought to the automobile industry and the society by implementing the technology was explained briefly earlier. The technology's motive is to reduce the danger of fire accident involved with automobiles and increase the safety perspective of an

automobile and create a reliable relationship between the manufacturers and their consumers, without adding substantial expense and weight for the addition of the technology in an automobile, these aspects of increasing the safety perspective and making the technology cost effective makes the anti-fire technology achieve its prospect to evolve automobiles to a better place.

Thermal energy conversion is a technology that earns its prospect to evolve automobiles to an advanced yet cost-effective level. While other technologies were more so common and universal to any automobiles the thermal energy conversion is also an evolution to the electric motor engines used in an automobile and helps them by making it usable and practical.

Thermal energy conversion main motive is to make electric powered automobiles more accessible to everyone and make that practically functional at any circumstances thrown towards it. The main imperfection faced with the electric vehicles from the earlier days to present is that they aren't as practical and reliable as a gasoline engine, they consume more time charging and the range to empty is comparatively low compared to its counterpart that its trying to replace the internal combustion engine, also the lack of charging station is also something that makes the electric cars less practical. With the help of the thermal energy conversion technology, the above-mentioned problems with the electric engine can be resolved, making them as practical as an internal combustion engine. With the thermal energy conversion design and functionality being simple and functional the usage of the thermal energy conversion can be extremely flourishing, with the technology continuously charging the batteries till they are absolutely charged even while the automobile is being driven or parked makes the electric motor never run out of electricity to produce power to move the vehicle, in a cold condition the help from the brake energy regeneration and deacceleration recuperation technologies helps back up the thermal energy conversion to charge the batteries, with all these functionalities the thermal energy conversion achieves its prospect to evolve electric segment in the automobile industry for the better.

Gearless transmission is a very functional technology that helps get rid of the complication in driving an automobile, it further helps in making an automobile lighter which reflects in a less

stressful driving and more fuel efficient engine with better performance. The gearless transmission uses its simple design, cost-effectiveness, and functionality to back the gearless mechanism achieve its prospect to evolve the automobiles for the better.

The design of the gearless transmission is modest it actually reduces the most important component used in an automobile to implement the produced power by the engine, the gearless transmission's simple design philosophy helps in detaching the transmission from an automobile which lessens weight, cost and driving complications, which results in better performance, a more agile driving characteristics from the chassis, better fuel efficiency, increases the endurance of the suspension bushings and reduces tire tread wear, which is commendable for a simple design to achieve various different prospects.

The reduction of transmission helps making the implementation of gearless transmission more cost-effective reducing the production cost of an automobile for the manufacturer which again helps price the automobiles considerably less costly compared with the vehicle that isn't equipped with the gearless transmission in the same segment. And the functionality perspective of the technology is user-friendly and making driving easy, and less stressful in a bumper to bumper traffic. It further encourages consumers to purchase who avoid buying cars because of its expensive pricing and complicated driving process, which helps the gearless transmission technology evolve the automobiles to a simpler yet advanced and affordable place.

All the above-mentioned prospects can be availed by applying the enlightened five technologies of mine. Which strengthens the future for the automobiles and the industry by resolving the common issues found in the world.

CHAPTER VI –CONCLUSION

The conclusion is where I synopsise the automobile architecture and touch up on some of the things that I recited for more knowledge about automobiles before writing the automobile architecture book, and before restructuring technologies like the air boost and flying car

mechanism, to understand how and what takes to move an automobile and sustain the momentum and speed effectively, the automobile architecture is a research that helps in the evolution of automobiles, making them more capable, constructive, practical, cost-effective and safer than before. The automobile architecture examined on numerous topics before leaping into the description of technologies, the introduction commenced with why automobile architecture is important and what is automobile architecture to explaining the evolution of cars and current automobile scenario, finally getting to why my 5 technologies were created, how it functions to lastly taking on the prospects and changes by implementing the technologies. This was definitely an experience for me, in the process of writing this book I definitely gained a lot of experience and knowledge about internal combustion engine, evolution in cars learning where it all started, about Archimedes principle, buoyant force, Bernoulli's theorem, transmissions, chassis construction, evolution in robotics, etc. The knowledge I've gained is precious and the process of writing this book is unforgettable. The technologies I've designed were solely invented to serve the ecosystem, society, and the automobile industry. The technologies are designed as an initiative to advance the automobiles and evolve them for the better, as been said multiple times, the implementation of technologies helps serve its purpose by recusing the impacts caused by automobiles in the environment and reconstruct the reputation over automobiles.

The automobile architecture is a research project that is written to showcase the technologies I've designed as an alternative or as an upgrade over the technologies and mechanisms used at the present, to solve the rising issues in the environment. The technologies were originally presented to the public as independent papers which is available on the website, while writing about them in a better scale for the automobile architecture book, the technologies were revisited to the development stage to reinforce it with roots and made practically implementable from a design and architecture aspect, while the engineering and science aspect is left to the concern that adopts the technology as from automobile to an automobile the usage and purpose varies. Specifically, technologies like the air boost technology has been reconstructed to be practical and functional the issues that could bother the technology were rectified to make it bullet-proof, all the technologies that have been focus on in this book ranging from the air boost - flying car concept - anti-fire - thermal energy conversion - gearless transmission, were made sure that it is functional and it's not an imaginary concept. Technology

like the “duo engine” has been integrated into air boost and thermal energy conversion as phase I in air boost technology and phase II in thermal energy conversion, to avoid the repetitive content and reducing the flow in reading. Again the technologies not only simplify the components in an automobile but also helps make automobile fix the issues caused by it to the environment, as a next step forward into the future automobile implementing these technologies into automobile can see a change all spectrum from the environmental change to change in society, automobiles and the industry itself. The technologies help automobiles to take a major leap and make them efficient and productive like never before.

➤ **SUMMARISING AUTOMOBILE ARCHITECTURE**

➤ **SUMMARISING THE TECHNOLOGIES**

➤ **JOURNEY TO REDESIGNING THE TECHNOLOGIES**

➤ **FUTURE TECNOLOGIES**

6.1 SUMMARISING AUTOMOBILE ARCHITECTURE

Summarizing research that is revolutionary, and helps emphasize the fact that automobiles can not only be a transport media or fun relishing medium but it also holds responsibility for the environmental causes and human health. The automobile architecture is a whole arch that discusses everything that started something to where it's heading towards and where it can be taken forward from here. Going through the book now, it definitely shows that automobiles is not just an invention to take one or multiple people from one place to another with comfort and convenience, while it originally started as an invention to take people from place A to place B faster and save time and physical energy, but over the course of time we saw the evolution that automobiles took, to comfort its passengers, automobiles is a huge part of a humans day-to-day life, and making them more practical and feasible without ruining it's quality standards and increasing its capacity to return back to the environment for the future is what the automobile architecture takes one, automobile architecture intention is to evolve automobiles for the better, from design, technology to its mechanism aspect.

The technologies that has been portrayed here is justifying to do just that. The technologies

help make automobile more economical before and after sales, which comforts the consumers and increase the peace of mind aspect of owning an automobile, increasing the accessibility of automobile, it helps to reach the thought that technologies don't need to be complicated in an evolution to prove itself as a modern tech, but can by making it simple and easy to use, the simple thought can take from scratch and do something impeccable with it, like the gearless transmission, air boost technology, flying car mechanism, and the thermal energy conversion and anti-fire technology, a small tweak or a thought can make a difference or find a more effective solution. The technologies put forth the same perspective. The thought and belief that I had on my idea of when air is a primary required element to produce combustion to make energy why can't air be the only element that can produce energy to power the vehicle, that belief lead me to multiple other technologies after the air boost, which is exactly what has been described and discussed about in the automobile architecture, the Automobile architecture is a complete take on what the automobile industry started as, what it has evolved into, what it's next evolution is and what the next evolution can be from my perspective by implementing my technologies.

Automobiles has taken a good evolution over the time, the manufacturers have produced some of the iconic automobiles in timeline, and automobiles where it sits now, is of the finest its at ever been, but change is something that cannot be changed, evolution keeps happening which finds itself as the best of all time, but with the automobile architecture research there are no criticisms on the technologies that have been introduced but the automobile architecture's intention is to how the next evolution can be for the automobiles, as every car manufacturer and government is focusing on producing the most eco-friendly and competent automobiles for the future to protect and preserve the nature from the impacts that are caused by automobiles of the past.

6.2 SUMMARISING THE TECHNOLOGIES

The technologies are designed to increase the reliability, robustness, affordability, and competence of an automobile for the better, and the technologies have the capability to succeed the objectives which have also been described earlier. Each technology are different from one

another, air boost technology can be used as a replacement power plant in a daily drivers segment automobile, while the flying car concept is entirely a new concept which can be a perfect solution to various issues, thermal energy conversion is an advancement over the electric engine available at the present to make them more capable and reliable, anti-fire technology helps in increasing the safety standards of an automobile, while the duo engine concept which has been integrated with the air boost technology and thermal energy conversion increases the versatility and flexibility aspect of an automobile and the gearless transmission reduces the complicated process in driving an automobile making it simpler to drive while reducing weight and cost of the vehicle, yet increasing the performance and efficiency of the vehicle.

As said each technology helps automobiles evolve to bigger and better spectrum by enhancing each part of an automobile. The technologies further help reduce physical and mental stress in driving an automobile by making them lighter, safer, efficient and dynamic. While these are the intention when designing the technologies, it further increases the sales and service of automobiles bringing in more customers for the manufacturers, in the process of increased sales it also helps in finding a solution to the impacts that can be caused by increased vehicle population, which is destruction of nature, which can be rectified by the flying car mechanism. These technologies increase the range and variety of products available in the automobile industry, which makes an automobile that is perfectly suitable for everyone's requirement. The technologies other benefits is that it brings a balanced relationship between nature and automobiles where it eliminates the pollution from automobile destroying the nature perspective and changes it to automobiles giving back to nature and environment by recessing the impacts that it caused. Because the technologies are made off of simple and lightweight materials the production cost of automobiles can be reduced significantly and which helps in bringing varies options in automobiles altogether at once increasing the versatility aspect of automobiles. It brings automobiles to be productive and serve its purpose of development yet fulfilling its responsibility to preserve nature. This development is sure to be the next step up for the automobiles, as manufacturers are working on their product line-up's to be environmentally friendly, and these technologies can help achieve the goal easily without complicating the mechanism and increasing the cost of the vehicle which reduces the reach of automobiles to the public.

Summarizing the technology would be that they are practical and made functional from a design and architecture perspective, and the benefits of bringing the technologies to life were explained briefly, the evolution that these technologies can bring to the future automobiles can be captivating as the next generation automobiles, robotics can prove that technologies don't necessarily need to be complicated and expensive to showcase its advancement but can prove itself by its functionality and productivity over its predecessor, automobiles holding a huge part in our lives, and having a bright future, making them efficient, functional and cost effective would be the next precise move to take forward the evolution in automobiles for the advancement of the society and environment. The technologies are designed to be inexpensive to mass produce, this allows the manufacturer to price their vehicles at much affordable cost that it reaches a wider set of audiences. The technologies diagrams portray a car that is developed with the technologies, the technologies can be universal and can be used to any transport medium with necessary modifications to fit in. The summary with the technologies is that because automobiles hold a major role in our daily life, and having a prediction that the vehicle populations likely to increase in the future, it necessitates the automobiles to be more responsible and ecological because the negative impacts that can be caused to the humans, wildlife and nature itself can be unconceivable, which is exactly the reason manufacturers are focusing on developing an electric or highly efficient hybrid assisted internal combustion engine to reduced to impacts, but by applying technologies like the air boost, thermal energy conversion and flying car mechanism in the future automobiles, not only the impacts can be reduced with the population increase but the impacts can be resolved. Nature and atmospheric issues can be streamlined back to normal.

6.3 JOURNEY TO REDESIGNING TECHNOLOGIES

Journey to redesigning the technologies, this is a very important part of my automobile architecture research as it helped make the technology like the air boost to more practical and functional, the air boost technology was originally submitted as an imaginary concept oriented to spark a thought of why not use air as a medium to produce power for automobiles, but when writing automobile architecture book after nearly a few years after creating the original concept

for the air boost technology I gained sufficient knowledge about automobiles, by watching multiple YouTube videos in which cars are being worked on where they describe the importance of each specific component for an automobile and why it was invented, all the knowledge that I gained in the due course of time helped me redesign the air boost technology and design other technologies by removing the part that I think wouldn't impact on drivability of a vehicle while creating multiple changes to the vehicles for the better.

Having my immeasurable interest towards automobiles I started to explore multiple automobile research websites like Car Dekho from where I read all the news articles that are happening in the automobile industry every day, which built my knowledge on where the automobile industry is headed towards and what is the present scenario,

Watching YouTube videos about cars histories, engines history and explanatory videos where they dismantle an engine or a component of an automobile and explain each part with its functionality, all the wisdom turned into a spark in me to change the automobiles for better and help in making an evolution, I put the gained knowledge to use, which is now the result of the much improved and probably the most functional air boost technology, flying car mechanism, anti-fire technology, thermal energy conversion, duo engine (Which is integrated into air boost and thermal energy technology) and gearless transmission yet ever made. The second phase of the social media travel leading to YouTube, where I was visibly able to see how the automobile functions, how an engine works, how many processes and tests a manufacturers go through to develop a production-spec model for the consumers, these research that I did made me enrich my knowledge about and around automobiles sector to a much greater extent.

6.4 FUTURE TECHNOLOGIES

Future technologies are where I talk and disclose about the possible future technologies and concepts that I came across as I'm nearing the end of my book automobile architecture. As improvement and advancement never stops in any industry, there are some ideas or concept technologies that sparked while I am nearing the end of writing my book, it is not something that has been worked on but having the baseline idea, next objective after the book is to research

more into automobiles to perfect these technologies that were to explain now and write a paper on later.

6.5 AIRPLANES FOLDING WINGS

Folding airplane wings, idea for this concept sparked when I saw how a peacock flies, the issues of land acquisition to expand the airport to accommodate more planes as the number of flights from multiple countries increase as most state government is planning on making their cities airport international, this causes multiple people losing their properties to government that lives close by the region of airport, by using the wing folding technology the wings can be folded into towards the planes body when the flight is landed on the airport and while parked, but once the flight gets back on its runway the wings can be unfolded back to its normal position increasing the parking space where three airplanes can be parked which is equipped with the wing folding technology in the place of just one, which isn't equipped with the technology. This helps increase the parking space, saving multiple millions of money invested in buying lands and expanding the airport, reduces the tension for the people lives by the airport region. Further allows even the biggest airplane to enter a significantly smaller sized airport. This is a concept that I came up with while writing the prospects and changes of flying car mechanism, but after the automobile architecture book, the next project would be to do further studies towards how to bring the folding wings technology to reality. and write a paper on this technology.

This is the wrap about automobile architecture. This is a journey that I will never forget, the knowledge that I gained by writing this book is astonishing. I am thrilled in bringing this book to the public. The book contains solutions to solve and rectify some of the deadliest impacts that are caused to the automobile industry, society, and the environment because of automobiles. With the manufacturers heading towards finding the solution for the rising issues, I think these five technologies, air boost, flying car, anti-fire, thermal energy and gearless transmission would be the right solution and a leap forward towards the next evolution of automobiles.

CHAPTER VII - SOCIAL RESPONSIBILITY

Automobile architecture contains fine solution, which makes it extremely social responsible. It helps deal with multiple issues faced in the environment and the society due to automobiles and make them user friendly. Because the automobile architecture has the solution to the most prominent issues and the rising predicted long-standing issues, the social responsibility is absolutely towards which others wise goes as part and parcel of manufacturing and integral. The issues faced in the society and environment due to automobiles are mainly due to pollution and its increasing population. The automobile architecture has ready solution in the form of five technologies, each serving for a greater purpose while each technology is special in its own way. The common prospect of the technologies is that it is extremely eco-friendly and efficient with its functions, which makes the automobile architecture progressive and implementation of these technologies can bring in for a much improved and advanced, simple, and cost-effective automobiles to the market, boosting the sales figures, yet being constructive towards the nature. The vehicle population is one of the highly predicted rising issues in society due to frequent upgrade in automobiles and increasing human population. The destruction caused to the nature in the process of accommodating the increase in automobiles can lead to deadly impacts, which would take a longer time to retrieve its normalcy once it hits the reality. Technologies like the flying car mechanism, air boost technology, etc. helps in reducing the effects of these issues and resolve before they intensify.

The automobile architecture concepts and the innovative technologies discussed help in evolving the automobiles to state of the art and to industry 5.0 as user friendly, individual specific in infinite permutations and combinations as ever evolving.

CHAPTER VIII - REVIEW OF LITERATURE - EVOLUTION OF CARS.

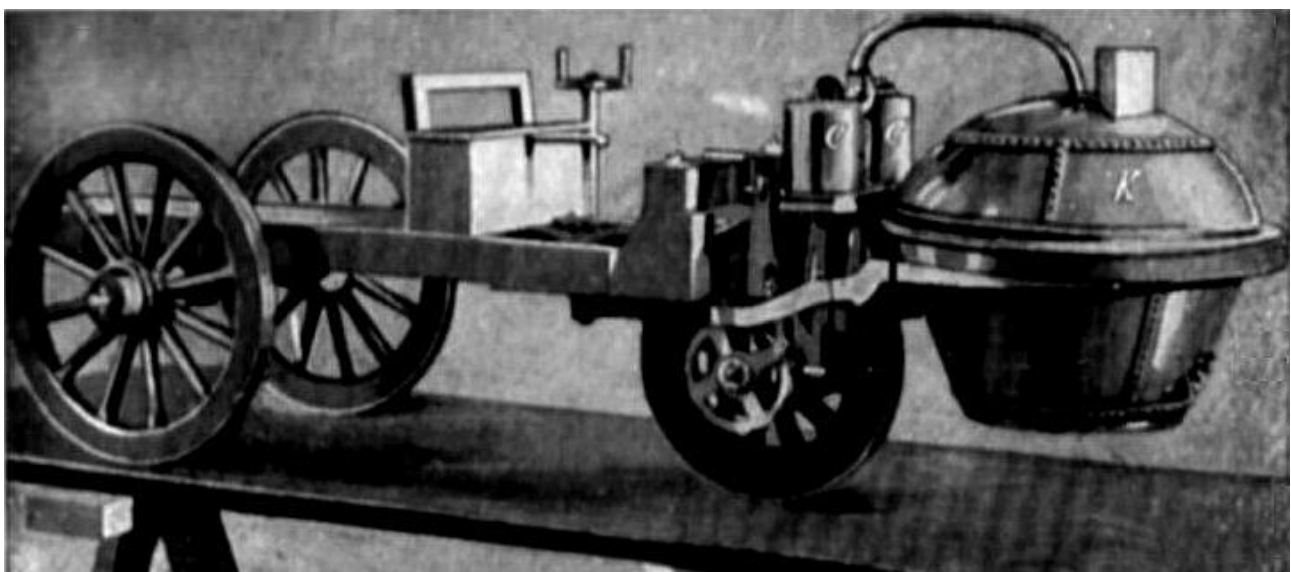
8.1 FROM 1672 TO 1863

Evolution of cars, this began back in 1672 when Ferdinand Verbiest who is a member of Jesuit mission in china, built a vehicle as a toy for the Chinese emperor, which was powered by a steam motor. Even though it wasn't a vehicle designed which can carry people around, it is likely the first working steam powered moving motor vehicle ever built and was called as *Verbiest's car*.



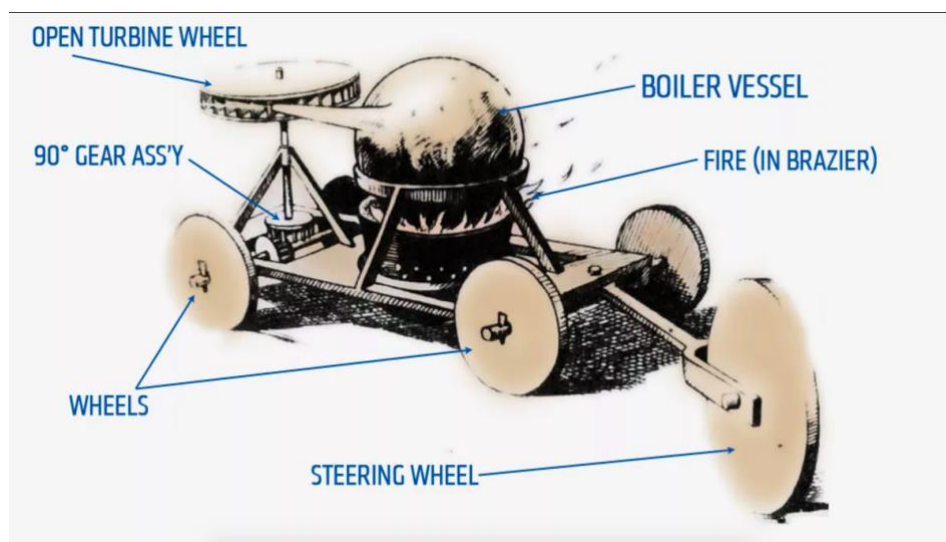
Verbiest's car worked on the principle of *Aeolipile*. Aeolipile is a bladeless radial steam turbine that spins when the central water container is heated.

In Verbiest's car, the rear wheels were driven by directing the steam generated in a ball shaped boiler to a simple, open steam turbine through a pipe at the top of the boiler.



Proper steam powered people carrying vehicle was invented in the 18th century, Most of historians will agree that Nicolas Joseph Cugnot from France was the inventor of the first original automobile. His automobile was heavy and huge steam powered tricycle and this model was designed in 1769. The vehicle weighed about 2.5 tonnes and had two wheels at the rear and one in the front where the horses would normally be in a carriage. The front wheel supported driving mechanism and steam boiler and the vehicle was steered by means of double handle arrangement. It was said to run for 20 minutes at 3.6 Kmph while carrying four people and to have recuperated sufficient steam energy to move again after standing for 20 Minutes.

A replica of Nicolas Cugnot's second automobile vehicle was partially original and it is being preserved in the Conservatoire national arts, which is located in Paris. Nicolas Cugnot's successors were soon took at work.

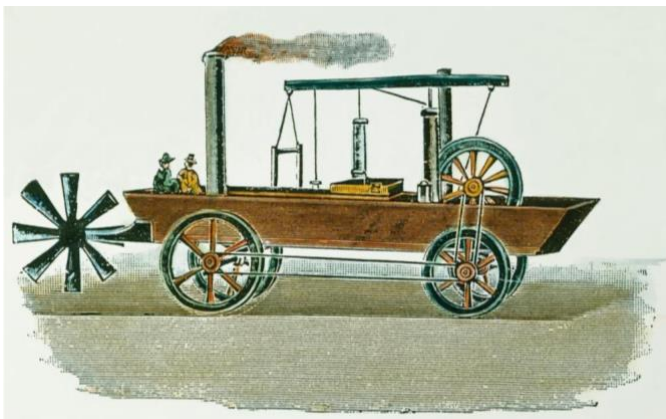
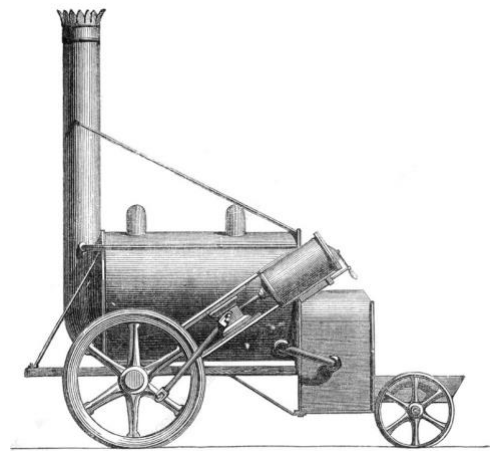


Steam engines were soon being popularized making it a niche area for research. Richard Trevithick, from British, Oliver Evans, Nathan Read, from America were all keen in inventing high powered steam engines that could be more efficient and purposeful in modeling a heavy vehicles and carriages.

All of them were keen in inventing high-pressure steam engines that would weigh lighter and help in running vehicles with carriage. Nathan Read built a multi tubular boiler and placed the steam cylinder in horizontal position as an effort to improve the function of the cylinder,

placing it horizontal could enable the engine to sustain much higher pressure. He then made several models of steam car and steamboat in 1790.

Richard Trevithick built his first models of high-pressure steam engines. In his model, a double acting cylinder was used where the steam distribution was done by means of a four-way valve. It avoided condenser by venting the exhaust steam via a vertical pipe or chimney. Instead of using a beam to convert the linear to circular motion, a crank was used for direct conversion of the same. Later in 1801 he built a full size steam locomotive that successfully carried six passengers.



Similarly, Oliver Evans too worked on inventing high-pressure steam engine that had a higher power-to-weight ration than the prevailing designs making locomotives practical. His design incorporated a grasshopper beam, double acting cylinder and four steam valves. Later, Evans looked for commercial applications of his invented steam engine and built a steam powered dredge and called it OruktorAmphibolos.

With continuous works and effort by inventors, manufacturing and use of steam road carriages started flourishing in 1830's.

Sir Goldsworthy Gurney is known to be the first commercially successful steam carriage builder. In the period of 1825-1829 he designed and built a number of steam-powered road vehicles commercializing the steam road transport business. This gave way for '*Gurney Steam Carriage Company*'. Gurney's initial design had carriages placed above the boiler. His steamers ran trips reaching top speeds of 20 miles per hour. Explanation of his first running vehicle says the vehicle had

- (a) A **handle** which guides the pole and pilot wheels,
- (b) The **pilot wheels**,
- (c) The **pole**,
- (d) The **fore boot** for luggage,
- (e) The **throttle valve** of the main steam pipe, which by means of a handle is opened or closed to regulate the power of the steam and the progress of the carriage from 1 to 10 or 20 miles per hour,
- (f) The **tank of water** with 60 gallon capacity running from end to end and to the full breadth of carriage,
- (g) The **carriage** capable of holding six inside passengers,
- (h) It also roomed to carry 15 outside passengers,
- (i) The **hind boot** containing the boiler and furnace, where the boiler is cased within iron sheet. Coke and coal were added between the pipes and the front side of the hind boot was closed in a usual way with iron door.
- (j) It had **separators** in which steam is separated from water, where the water descends returning to the boiler while the steam ascends forcing into the steam pipes or main arteries of the machine.
- (k) The **pump** by which the water is pumped from the tank by means of a flexible hose to the reservoir, communicating with the boiler.
- (l) The **mainstream pipe** from the separators to the throttle valve in a direct line running under the body of the coach. From the throttle valve to the cylinders from which the pistons work.
- (m) **Flues of the furnace**, 'Flue' is a duct or opening in a chimney for conveying exhaust gases from fireplace, which in this case is the engine emission to the outdoors.
- (n) The **perches** (a pole or rod that's generally aligned as a place for resting something upon it), three perches conjoined to support the machinery.
- (o) The **cylinders**
- (p) **Valve motion** that allows steam to enter alternately to each side of the pistons.
- (q) **Cranks** operating on the axle.
- (r) At the end of the axle are **clutches** which as the axle turns round catch the projecting pieces of iron on the wheels and give them the rotary motion thus helping to operate the hind wheels of the vehicle.

(s) **Propellers** to help the carriage climb hills. While climbing the hills, propellers are set in motion, it acts like the hind legs of a horse catching the ground and forcing the machine to move forward increasing the rapidity and assisting the steam power.

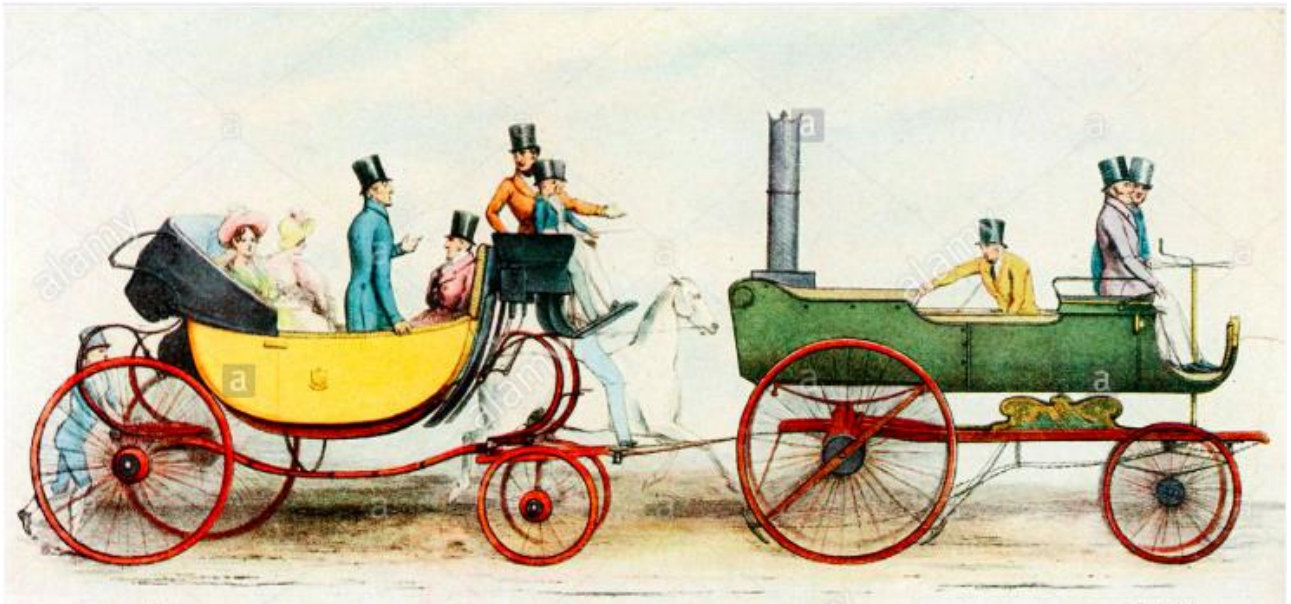
(t) **The Drag**, which is applied to increase friction on the wheel while its driving down a hill. Along with the drag, the pressure of the steam is diminished to enable the vehicle to adapt with the downhill traverse.

(u) The **safety Valve**, which regulates the pressure of the steam in the pipe to be proper.



In 1828 his carriage climbed old hill, In 1829 Gurney steam carriage company served route from London to Bath at an average of 14 miles per hour including stops for water and fuel which is nearly double the speed of a horse coach.

Although gurney was careful to maintain safety standards, one of his coaches, operated without his supervision blew a boiler killing two people that provoked criticisms. This made the steam carriage to be commercially unsuccessful. People apprehended to convey atop a steam boiler that had risks of causing danger.



As a solution, Gurney designed and built “The Gurney’s Steam Drag”. Gurney’s steam drag had two coaches, one that had the engine along with the pilot and the other that carried passengers.

Innovations such as hand brakes, multispeed transmissions and better steering developed in this period time, i.e, in the 19th century.

In 1867, Henry Seth Taylor built the first known car, the four-wheel “Steam buggy”. The buggy had a coal-fired boiler. Fully pressurized; the steam was used to move a piston attached to the rear axle producing the forward motion. It was able to travel at 12 miles per hour. It lacked reverse gear or brakes.

During the later part of 19th Century, there were a series of acts passed by the British parliament to regulate the use of mechanically propelled vehicles, the Locomotive Acts.

The Locomotive Acts contained restriction on the manning and speed operation. Concepts like Vehicle registration, registration plates, speed limits, and



maximum vehicle weights over structures like bridges were all introduced through this act.



The Locomotive Act of 1865 imposed all mechanically propelled road vehicles imposed to travel within the speed limit of 4 miles per hour in the country and 2 miles per hour in the city limits. It also mandated every road vehicle to be preceded by a man carrying red flag blowing a horn. Further developments and focus on road transportation halted with the limitations and constraints imposed by the Locomotive act shifting the

focus and works towards railway transport.

In 1878, the need for the red flag was removed and later the locomotive act of 1896 removed some restrictions that were previously imposed by the 1865 act, raising the speed limit to 14 miles per hour. It was the Locomotive act of 1896 that provided legal provision for automotive industry in UK to develop soon after the successful development of first practical automobile.

One of the first real automobile was produced by Amedeebollee in 1873. “The Obedient” (L’Obeissante) of AmedeeBollee was the first real automobile, it carried 12 passengers and had a cruising speed of 19 miles per hour and a top speed of 25 miles per hour.



It had

- a) Chassis with independent suspension on all four wheels,
- b) Front wheels steering with chain drive on an elliptical pinion connected for driving the differential deflection of the outer wheel and the inner wheel to turn,
- c) Propulsion by two steam v-twin engines independently connected to rear wheels
- d) Boiler at the back
- e) Centralized controls around steering wheel

Similarly, In 1873 Dr.J.W.Carhart invented the first automobile known in US called the “SPARK”. Spark had two reciprocating engines attached to the boiler upright and in the rear of the seat, each engine independently propelling a drive wheel thus removing the need for differential gears. Lever and chains attached to the front axle turning on a fifth wheel like a buggy fashion took care of the steering. Hard coal was used as fuel. It had its boiler furnished with whistle, steam-gauge and a safety valve.

In 1894, David Shearer designed and built the first car in Australia, which had a horizontal boiler of semi-flash type capable of running 15 miles per hour. Around this period of time, steam vehicles for road transport started to show up at different places of the world.

By 1899 America had its earliest car manufacturers, “*The Locomobile Company of America*”. The company manufactured affordable, small steam cars.

In 1902, Stanley Brothers started the *Stanley Motor Carriage Company*, which made the famous models Stanley Rocket (1906), Stanley K Raceabout (1908) and Stanley Steam Car (1923).

During the same time period, lightweight steam cars were being built in the United States, Germany and France. It was possible to argue that the line from Nicolas Cugnot’s lumbering vehicle runs unbroken to the 20th Century steam automobiles as late as 1926. The grip of the steam automobiles to the American imagination had been strong since the era of the Stanley brothers one of those, whose steamers took the world speed record to 205Kmph in 1906. Cars manufactured and sold by them, as the Locomobile became the first commercially successful American made automobile, nearly 1,000 of these cars were built in the 1900. It was said that by the year of 2000 there were still 600 steam driven cars in the United States and most of them still in running condition.

8.2 ERA OF EARLY ELECTRIC AUTOMOBILES

By the beginning of 20th century nearly 40% of the American automobiles were powered by steam, 38% by electricity and 22% by gasoline. In a time period where the gasoline powered vehicles were known to be not reliable, noisy and the steam driven vehicles had complications and thirst, the electric powered motors offered attracting selling points like instant self starting, minimal maintenance and quiet operations. The very first automobile to exceed 100Kmph speed was an electric powered vehicle, driven by a Belgium racer Camille Jenatzy in La JamaisContente, in 1899. The car's best top speed was 105 Kmph. Invention of the storage battery was found by Gaston Planté from France in 1859-1860, and improvements by Camille Faure in 1881 to the technology made the electric vehicle a possibility. What was probably the first tricycle that ran in Paris in 1881 which was followed by other three wheelers in London by 1882 and in Boston by 1888 was all-electric.

The First American battery powered automobile built by William Morrison was able to maintain a max speed of 23 Kmph.

The Growing popularity of the electric car was hampered by a lack of infrastructure in charging batteries. Prior to 1910, few private homes, even cities were wired with electricity, community charging stations and battery exchange schemes failed to catch on. But in 1912 the problem was addressed and the electricity was at its high peak. Companies were in trade and nearly 33,000 electric cars were registered in the United States, the country in which they had maximum acceptance.

Further the electric car had never really been suited to other than limited urban use because of its low speed, low drive range and the time consumed to charge the battery was a huge disadvantage. The demand period for the electric cars in America ended by 1920, however some manufacturers offered them in special order till World War II, the war however increased the opportunity to experiment more with small electric cars in France due to fuel scarcity, which resulted in an extensive use of electric vehicles in Britain, which continued to the urban areas for rest of the century. It might also be viewed as reducing the demand pressure alternating with fuel

driven cars, which had their own limits to curb fantasy and niche for higher end version as something better at that point of time. Today the scenario is different and that bringing back the history to review might reinforce better understanding on the economy altogether and comfort with automobile industry taking electronics to quantum level that automation and robotics sway between each other and makes driving effortless, safe and a positive experience to give up foot prints, leave away the obsolete and bring in innovative, creative thoughts, building confidence in everyone as they are no more achievers waiting for someone to be preyed, galloped and lifted, every one of them are accomplishers to build their own dynasty. The fear of getting swirled up, left with no other option is waived out by Internet.

8.3 ADVANCEMENT OF FUEL DRIVEN (GASOLINE) VEHICLES

Most authorities are inclined to give honor to Karl Benz and Gottlieb Daimler from Germany as most pioneer contributors to the gasoline powered engines, Karl Benz ran his first car in 1885 and Daimler in 1886. Although there is no reason to believe that Benz had ever seen a motor vehicle before he made his own. Etienne Lenoir from France and Siegfried from Austria had preceded them in 1862 and 1864–65, but neither Lenoir nor Siegfried Marcus had persisted. Benz and Daimler did persist indeed, to such purpose that their successor firm of Daimler AG can trace its origins as far back as 1885.

The four stroke principle upon which most modern automobile engines work was discovered by a French engineer called Alphonse Beau de Rochas, in 1862, a year before Lenoir ran his car from Paris to Joinville-le-Pont. The four-stroke cycle is often called the Otto cycle because of German Nikolaus August Otto who designed an engine on that principle in 1876.

Etienne Lenoir's omitted the compression stroke of the Otto cycle. The fuel was injected into the cylinders on an intake stroke and was ignited with a spark halfway through the reciprocal stroke, the idea of Siegfried Marcus's 1864-1865 car seemingly came to him by a prospect when he was considering the production of illumination by igniting fuel with mixture of air with a series of sparks.

The result for it was so vicious that it happened to use it as a source of power, his first automobile was a handcart attached to a two cycle engine which was geared to the rear wheels without any intervening clutch, it was started by using a strong man lifting the rear of the vehicle while the wheels were spun, after which the vehicle ran for a distance of 180 Meters.

Siegfried Marcus's second model a 1888-1889 car, was solid and durable well preserved to make a demo run on the streets in 1950.

MEANWHILE IN GERMANY

Meanwhile in Germany Karl Benz was completely dedicated to the theory that the internal combustion engine would replace the horse and could reform the world's transportation system. He continued with his efforts in building a gasoline powered internal combustion engine vehicle.

Karl Benz ran his first car, which was a three wheel powered by a two cycle and one cylinder engine, on a successful day in early 1885 he did a run in a cinder track, the little machine done four laps on the track with stalling only twice before a snapped chain stopped it.

Even Max Rose, who was Karl Benz's financial partner, whose money made the vehicle a possibility, by the end of this project he was mildly impressed, but just like Siegfried Marcus he too remained convinced to the end of his alliance with Karl Benz that there was no future improvisation in the horseless carriage.

But Karl Benz made his first sale to a Parisian named Émile Roger in 1888. Gradually, his product name started to flourish for its design, quality and care that went into the materials used and construction of his cars bore weight made them sell well. By that year Karl Benz employed 50 workmen to build the tricycle car. In the year 1893, he began to build a four-wheeler.

In this way Karl Benz was adamant and reactionary like Siegfried Marcus had been, he was against to redesign his original concept cars, and even authorities believe that he was never convinced that his original concepts had been improved over the time.

GOTTLIEB DAIMLER

Gottlieb Daimler was from Germany he is one of the huge figures in the history of early automobile industry.

Gunsmithing was Gottlieb Daimler's first occupation, in Germany he was employed in various engineering and machinery concerns, including Maschinenbau-gesellschaft which is a concern that much earlier employed Karl Benz.

In 1872 Gottlieb Daimler became technical director in German Nicolas August Otto's Company. Then building stationary gasoline engines. During the next decade, significant works were done to the four-stroke engine, several research scientists were brought in by Gottlieb Daimler. In 1882 both Daimler and Maybach resigned from the Nicolas Otto's concern because of Daimler's conviction that Nicolas Otto did not understand the capability of an internal combustion engine, later Gottlieb Daimler and Wilhelm Maybach set up a shop and built a one cylinder engine, it was the first high speed internal combustion engine, it was designed to run at 900 RPM, in comparison to Karl Benz's first tricycle engine that functioned at 250 RPM. Then Gottlieb Daimler and Wilhelm Maybach built their second engine and mounted it to a wooden built bicycle, which was fitted with a outrigger that they first ran in 1885.

In 1886 Daimler built his first four-wheeler road vehicle, a carriage modified to be with a one-cylinder engine.

In 1889 Rene Panhard and Emile Lavassor entered the field independently, Rene Panhard and Emile Lavassor's designs from 1891-1894 was for primary importance, as they were the true automobile and not a carriage converted for self propulsion.

Gottlieb Daimler's car from 1889 was a major departure from his previous practices, it was a framework which was based on a light tubing, it had the engine mounted in the rear and the wheels were propelled by a belt and it was steered with a help of tiller, which is a horizontal bars that helps steer. Surprising this car had four speeds and had a good commercial value, in the following year the Daimler MotorenGesellschaft motor company was found.

The British Daimler automobile was started as a manufactory licensed by a German company, but later it became independent. Daimler and Benz Firms were merged in 1926, and thereafter the products were sold under the name of Mercedes Benz. This practice is being executed, despite in 1998 merger with the American concern Chrysler Corporation to form Daimler Chrysler AG.

8.4 IMPROVEMENT OF CARS IN EUROPEAN COUNTRIES

In France the giants were De Dion-Bouton which was found in 1883 and operations got ceased by 1932, Peugeot SA which was found in 1896 which is still in function and Renault which was found in 1998 and still in function.

The Italian companies later got into the field, Stefanini-Martina an Italian company of 1896 is thought as the foundation for the industry in Italy, Isotta Fraschini another Italian car company was founded in 1899, by the same year Giovanni Agnelli founded Fiat Spa Company. Watching the company grow into one of the strong industrial complexes in the world and maintained a personal control on the company till his death, which occurred in 1945.

The Smaller European Countries had brands that were to remain as less well known like, the Austro Daimler, Tatra and the Hispano Suiza a brand founded by Marc Birkigt.

8.5 DEVELOPMENT OF CARS IN UNITED STATES

Daimler and Benz claims that the inventions of automobile were attacked in 1895 when United states patent 549 160 was granted to George B Selden from New York, who is a patent

lawyer and the inventor who was granted with a U.S Patent for an automobile. However he filed his application for patent in 1879, but not having a built automobile at that time.

Most authorities credit Charles E Duryea and J. Frank Duryea for creating a successful American gasoline powered automobile in 1892. The concept for the vehicle was originated from Charles E Duryea and the vehicle was built by Frank Duryea. The vehicle consisted a one cylinder gasoline powered engine with an electrical ignition installed to a carriage. It was first run in 1893.

In 1895 driving a later built model car, J. Frank Duryea won the first automobile race in America in which more than two cars completed the race. The race was from Chicago, Evanston, Illinois and back to Chicago. By the same year, Charles E Duryea and J. Frank Duryea found Duryea Motor Wagon Company.

Nearly 13 cars were built in 1896 by the company. The Variations on cars built by the brothers who soon got separated, and the company was closed.

The Duryea Motor Wagon Company was definitely not the first American built automobile. Numerous of steam engine carriages were built after Oliver Evans Steam powered dredge. Nor the Duryea Motor Wagon was the first American Built Internal Combustion Vehicle, Sephaniah Reese is a Machinist From Pennsylvania who built a Gasoline powered Tricycle which was completed by 1887. And Henry Nadig, Who is another inventor from pennsylvania, He Completed and tested his car in 1891.

William T Harris from Baltimore and Gottfried Schloemer from Wisconsin, built successful vehicles in 1892, Sephaniah Reese, Henry Nadig's cars still existed. Elwood Haynes who is an American inventor from Indiana followed the foot steps of Duryea brothers and demonstrated his gasoline powered car in 1894 and Charles Brady king who is a automobile engineer and an entrepreneur, built a car in Detroit that first ran in 1896.

Ransom Eli Wood who is an automobile pioneer, was also active in research of gasoline powered engines in the 1890's, initially being interested in steam powered engines. By 1898 more than 100 companies had been organised with the objective of automobile manufacturing.

The three horsepower curve dash oldsmobile surpassed the steam loco mobile as the America's best selling car in 1902, by selling 2,700 vehicles. The company's prosperity was noted by other companies, and from 1904-1908, nearly 241 car manufacturers went into business in United States. One these manufacturers was Ford Motor Company, which was organised as a corporation by June 1903 and started the selling their first car by the next month. Ford Motor Company produced 1,700 cars during it's first year of business.

8.6 FORD AND AUTOMOTIVE EVOLUTION

Henry Ford who is the founder of ford motor company, from Michigan produced eight models previous to 'Model T', the model which made his name prominent. But these were the models produced by Henry ford before Model T, Model A,B,C,F,K,R,S and N.

They were not exceptional automobiles but public's response to the less expensive ones, indicated the soundness of ford's idea to turn the automobiles from being a luxury or a plaything to a necessity by making them cheap, flexible and easy to maintain.

By the Mid 1920's the American automobile had won the revolution that ford had begun, automobiles sales was on growth in the country, the manufacture and the sales of automobiles became a important part in the American Economy. The closed car's were no longer a type of vehicle only for the rich people, because in the early 1920's majority of cars were open models. In 1922 Essex Coach introduced a two-door sedan by Essex Motor Company, which was owned by Hudson Motor Company. This reduced cost of closed automobile for a touring car. Ten years later, Detroit manufacturers produced closed automobiles exclusively.

1920's saw the emergence of great European automobile manufacturers like Austin Motor Company, Morris Motors and Singers Motor Limited in England, Citroën in France and Fiat

Automobiles in Italy. Universal Motor Transportation was a long way, but the concept of small car was found in the Austin Seven and the Fiat Topolino also known as 500, two of the descendants of Ettore Bugatti's Tine Peugeot Bebe also known as Type 69 of 1911, was to have an extreme effect.

By middle of the decade, the American industry became global, Ford Motor Company started to assemble Model T's in the Britain in 1911 and general motors corporation bought a Vauxhall Motors Limited a British Company and Opel automobiles a German based company, Later Chrysler Automobiles and Hudson motor car company too. Later they began assembly in other parts of the globe. American cars had established a great export trade after WWI, the time when they were recognized as a robust built, reliable and cheap to afford. Multiple countries adopted taxation and duties against it. By beginning of 1930's, these policies resulted as a downfall for the large car segment in Europe, so a new genre of small cars which were a little bigger than the Austin seven was manufactured for the market, making the standard ford vehicles no longer a world car.

Significant technological developments were made by 1920's-1930's, like the addition of four wheel braking system, radios, independent front suspension are one of the noticeable improvements made. Transmission with a synchronized gear made the driving easier.

Six cylinder engines were introduced which started to replace the four cylinder engines, and straight eight engines were adopted by many car companies, an important exception to Ford's famous V8 which was made in 1932, specially for its single casting and lively performance it delivered.

8.7 THE AGE OF CLASSIC CARS

The 1925-25 was important not only for the appearance of the new mall automobiles, but also for the building of excessively large cars too. The year from 1925 to 1948 are specified as the classic years, by the automobile car collectors. This is the period that saw rise of luxurious fast cars to a peak, seems unlikely to reach again. The first name in the industry was Rolls Royce

Limited, found in 1906, most Rolls Royce had chassis designed for limousines and large sedans bodies, but the company once made comparatively a light car called the twenty.

After WWII, Bentley Motors Limited built continental, Other motorcars of this type included the the Bugatti, Cadillac, Packard, and Pierce-Arrow of the United States the Horch, Maybach, and Mercedes Benz of Germany. These Machines were expensive, and was capable of doing 145-210Kmph, as comfortable as the design could be made.

The most expensive standard automobile of which there exist convincing records was the Bugatti Type 41 which was produced in the 1920's by Ettore Bugatti in France, The Bugatti Type 41 is also called as the La Royale, Was cataloged at a chassis price of \$20,000. Only six of these cars were produced. In 1929, the Stock Market collapse signaled the downfall of the luxury cars, after WWII, Even Rolls Royce discontinued its policy of producing a standard chassis for a custom made body, and offered a standard sedan that could be bought straight off the showroom.

With the demise of luxury cars in the market created a downsizing of the industry, The depressions in America and its fallout in other counties, as consequence in failure of most independent manufacturers and caused others to market lower priced cars, as a verdict, the automobile market in United States became dominated by General Motors, Ford Motor Company and Chrysler Automobiles. Similar effect was spread through overseas market too.

8.8 POST WAR AUTOMOBILE DESIGNS IN EUROPEAN AUTOMOBILE INDUSTRY.

When automobile manufacturing was resumed in 1946 after WW II, the effect in Italian ideas on world's automobile body designers was profound. Pininfarina S.P.A from Turin is a well known concern for building coach by establishing their Italian Characteristic approach. Designs clearly derivative of those of Italian origin that appeared everywhere, and Manufacturers from France, The United Kingdom and The United States contracted for the services of Italian Body Factories.

The appeal of American cars worldwide started to fade, not only they were too large of cars and expensive to operate in a land which is recovering from the war, But for also those countries that were in dire need of cash from export trade. For the first time since early in the century America began importing cars in significant numbers.

Characteristics of automobiles such as the British Two Seater MG, plus their availability at a time of short domestic supply made them attract consumers, and the importing of European made models into the United States Increased rapidly.

At first majority of these were the British vehicles, But by Mid 1950's Volkswagen, Which was originally envisioned by Adolf Hitler as a People's car in Germany, had a sturdy grip on the American Automobile market accounting for half of the import sales.

In Engineering, Much American experimentation followed research begun by the European automobile industry for development of gasoline turbine engines, Front Wheel Drive, Fuel Injection Systems, Disc Brakes and Rear Mid Engine. The gasoline turbine engines did not fulfil their promise, but the advancement eventually became common practices.

Front Wheel Drive (FWD) was largely been abandoned after 1930's, Although the French automaker Citroën had success with their Traction Avant, even Saab AB a Swedish aircraft manufacturer used it, for their entry into the automobile industry in 1950. But it was the British manufacturer Mini designed by Sir Alec Issigonis and sold the car under the name of Morris and Austin, that pioneered the front wheel drive concept as it is known now.

Issigonis was endeavouring to gain the greatest space effectiveness from a small car. In Order to achieve this he pushed the wheels to the farther most corners of the body, and to get maximum cabin room inside, He turned the engine sideways and lasted it right on top of the transmission, Mini was extraordinarily successful.

8.9 RECOGNITION OF V8 ENGINE AND CHROME IN AMERICA

In America, Automobile racing in the years around 1910 was drawing attention of crowd in the American racing history, Automobile racing started to regain attention of the population following WW II, By the Mid 1950's car racing had so many viewers that it became the highest ranking American sport, By 1969 estimated attendance was 41,300,000, Which was higher than both football and baseball sport. By 1950's and 1960's American Car manufacturers started testing new automobile engineering's designs and concepts at automobile racing. Ford GT was most successful by winning the Le Mans 24 Hours Grand Prix race, it was the first American car too in the 1966 and 1967. Producing in a remarkably short time, it was a racing engine that dominated majority of American race tracks.

Public started craving for performance and V8 engines, increasingly with high compression and overhead valves, which became universal in America, more cars were delivered with an automatic transmission, which was first used by Oldsmobile in 1940. Air Conditioner, A experiment which gave unsatisfactory results Before WW II, was introduced again. Pontiac introduced it as a compact system in 1954, which was capable of installing in the engine compartment, resulting in an increase in popularity.

8.10 DEVELOPMENT IN AMERICAN COMPACT CARS

The size of a standard American vehicle was increasing steadily from the late 1940's to the 1960's, small Segment of the consumers were showing interest on small compact cars with uncluttered styling. The success of Volkswagen and other small car manufacturers, eventually led the major american manufacturer's to simultaneously undertake the productions of Compact Automobiles, With having wheelbase under 2,800mm, Ford Falcon, Chevrolet Corvair and Chrysler Valiant were the compact cars produced by the Leading American Manufacturer's, These Cars were smaller than the standard American vehicles but slightly larger than the Standard European vehicles.

By Mid 1960's Demand was created for a Highly individualised luxury models of the compact size, had brought lines for a midway cars from all the automobile car manufacturers.

Ford Launched the Mustang, Which is basically a Ford Falcon modified into a sports coupe, Created a new pace of genre which was called the pony cars. A similar exercise in market engineering at general motors created Muscle Car, An Mid-way size car with a larger engine from the top of the line, as typified by the Pontiac GTO.

8.11 GROWTH IN JAPANESE CARS

Despite the fact that Datsun which is a concern of Nissan motor company have been manufacturing car since 1914, majority of automobile sales in japan before 1936 came from Ford's Subsidiary unit located in Yokohama. However, Datsun and Toyota Motor Corporation, was former originally a textile machinery company, that dominated for that time. The post WW II recovery process was slow, Only a mere 13,000 vehicles were produced in 1955, but both the companies exported vehicles to the United States by 1958. The first car to sell in any quantity was a Toyota Corona that was introduced in 1967, While the car being 100 dollars expensive than the Volkswagen Beetle, the car was slightly larger, with being better appointed and had an automatic transmission on offer as an option.

The 1970's was a stagnant year for the American automobile industry in-terms of design, As the research and engineering was focused towards safety and meeting with the environmental regulations, which was resulted by the laws validated by congress, by beginning of 1966. Engines were tweaked to emit less pollutions, By sacrificing fuel efficiency, however fuel shortage and price increases during that time period made this a counterproductive approach. Safety advancement included a seat belt, redundant braking system and strengthened bumpers to handle the impacts.

The availability of fresh designs with high perceived quality from the Japanese automaker. Honda Motor Company, which was originally motorcycle manufacturer, Offered an advance compound vortex controlled combustion chamber, which easily met with the American Emission Norms, the time when American manufacturers were claiming that it is impossible. Honda's Accord that was introduced in the market by 1976 offered the refinement and superior economy comparing with the American models, although at a slightly higher pricing. The accord

was an instant success and resulted in Honda constructing a manufacturing facility in Ohio State. In 1989 Honda Accord became the best selling passenger vehicle in the United States.

8.12 EVOLUTION FROM STATION WAGON TO SPORT UTILITY VEHICLE

(SUV)

Till 1948, Station wagons have been the only utility vehicle, with a wooden body and a little in the way of versatility and comforts. 1949 Chrysler Automobiles launched an all metal station wagon with its entry level Plymouth line up. Within three years all car manufacturers started offering them, a new genre of stylish yet family utilitarian transportation vehicles were born.

By the Mid-1980's the station wagon became mostly vanished as the front wheel drive minivans were in popularity. Sir Alec Issigonis's Idea of designing the mini was obtained by manufacturers, Minivan featured a transverse power package and rest of the vehicle dedicated exclusively for the passengers. The first example of this ideology was the Dodge Caravan, Which was rapidly picked up by other manufacturers and taken overseas, Where it got names as the Multipurpose Vehicle (MPV).

General Motor Company introduced a whole range of new sedans which offered the transverse engine front wheel drive in 1980. This paved the path for this to become the dominant automotive architecture within 10 years. These were generally smaller and lighter than their predecessors and were powered by a comparatively smaller engines, V8 engines were replaced by a smaller V6 Engine making it a popular choice of option.

In the 1990's Consumers exhibited another change in preferences, as a Four wheel drive mid-size vehicle, a descendant of the WW II Jeep became extremely famous among the consumers. Generally known as a Sport Utility vehicle (SUV), this segment reached the luxury car makers like Cadillac and Porsche. The SUV Craze was aided with stable fuel prices, At the beginning of 21st century, Most car manufacturers started introducing car like crossovers, Which

was a trend that escalated through the first decade of the century due to rising costs of fuel, suppressed the enthusiasm for the Full Sized SUV's.

8.13 ALTERNATIVE FUEL FOR VEHICLES

8.13.1 DIESEL

After WW II, the diesel engines, particularly became popular for light weight trucks and taxis, for its extraordinary fuel efficiency and tax incentives.

During 1970s General Motors converted gasoline powered passenger car engines to the more economical compression ignition diesel operation and Mercedes Benz, Volkswagen and Peugeot marketed their diesel engines, that powers their European models. The fuel availability and the composure in gasoline prices, combined with the downsides effects of the diesel engine like noise and poor cold weather starting, reduced the demand for diesel engine in America in the early 1980's. In Europe, which had not included diesel engines for their private passenger vehicles, reversed the course with the development of environmentally friendly common rail direct injection diesel engines in the late 1990's. By 2005 nearly half of the European car sales was contributed by diesel cars.

8.13.2 ELECTRIC VEHICLES

The First of the fuel crisis, in 1973-1974, recreated interest in electric vehicles in America. Numerous experimenters and entrepreneurs began to work on battery cars, the most successful being the Citi car built by a Florida based company, Sebring Vanguard Inc.

The citi car had a plastic with wedge shaped two seater body over a welded aluminium chassis. Lead acid batteries supplied power to a 3.5 horsepower from a electric motor. with about 2,600 cars built between 1974-1976, And Comutacar which was another successor contributing 2000 cars which were built between 1978-1981, The citi car was the most productive electric cars made in the late 20th century. Ultimately, the falling price on fuel put an end to the electric vehicles sales.

Subsequent alternative propulsion programs were driven by the environmental concerns, in 1990 the California Air Resources Board mandated that within eight years from then, all manufacturers should focus to two percent of their sales should be zero emission vehicles. For all the practical purposes this meant battery electrics.

General Motors took this edict serious, and started working on aluminium frame, composite plastic body with low rolling resistance tires, in 1996 they introduced the model as General Motors EV1, The vehicle was offered for lease through dealers in Arizona and California state.

Only 800 were contracted for, and production halted in 2000, with 100 remaining in service through 2005. In 1998–1999 General Motors and Ford also offered battery electric pickup trucks, most of which were placed with government fleets. The shortcoming of all these battery electrics was their limited range less than 100 miles with lead acid batteries.

More capable nickel metal hydride cells were inordinately expensive. The faltering efforts resulted in relaxation of the California mandate.

8.13.3 ELECTRIC-GASOLINE HYBRIDS

In 1997, Toyota introduced its four seater passenger car Prius hybrid for the Japanese market. Combining a small gasoline engine with electric motors through a sophisticated control system. The Prius uses its gasoline engines power only to supply the necessary supplement to the electric propulsion or to recharge its batteries, By the same year Audi duo was introduced which is a hybrid vehicle from European manufacturers but due to its poor sales led European manufacturer to focus on diesel engines. Honda Motor company was the first manufacturer to introduce hybrid into the American Automobile Market in 1999.

In order to establish hybrid technology in the American market, Toyota initially offered substantial deals on the Prius when it was first introduced in America on 2000. U.S and some

state governments also offered tax incentives and other perks to promote the production and sales of alternative fuel vehicles.

Even though the Prius offered only a relatively modest increase in fuel efficiency, the removal of any need to plug the batteries in for charging overcame the main drawbacks of the pure electric vehicles. The Prius was an immediate success with the trend-conscious Californians, with many celebrities preferred driving hybrids over their luxury vehicles and the prospective buyers had to wait months for delivery. In 2004 Ford Motor Company Launched Ford Escape Hybrid which became first American Built Hybrid, beating two General Motors Silverado and GMC's Sierra Truck, to market by one year.

The first luxury hybrid vehicle, the Lexus RX 400h, was released in 2005. In 2010 General Motors introduced the Chevrolet Volt, a car that could drive up to about 35 miles on electric batteries and would then drive using a gasoline engine after the battery was exhausted.

8.13.4 ETHANOL AND FUEL CELLS

In 1999, Brazil mandated that by 2003, all new cars sold in the country had to be Flex Fuel vehicles. vehicles certified to run on gasoline containing up to 85 percent ethanol, marketed as E85. This initiative led numerous American, European, and Japanese manufacturers to certify some of their models as E85-compliant, which is indicated by the eighth character in the vehicle identification number, or VIN.

General Motors, Ford, and Chrysler primarily have concentrated on fuel cells development, assisted by U.S. government grants. However, usable technology for the general public is still years away.

Though blending ethanol with fuel will help in reducing the consumption of actual gasoline, it is not a permanent fix for the fuel shortage issue with the rising pollution problems with the Internal Combustion engines, Especially Diesel powered Internal Combustion engines the Emission grade is being raised to emit less pollution.

With the rise in Emission Standards in India, the diesel-powered cars are expected to see a steep price fall compared to its counterpart the petrol powered motors, which leads to the expectation of the diesel-powered motors see a downfall and rise of the petrol powered vehicles. Automakers are planning on dropping the Diesel power trains from their passenger vehicle line-up and producing hybrid powered petrol power trains. Increasing the properties of the hybrid motors and electric motors replacing the internal combustion engines for the passenger car line up.

8.14 POLLUTION AND CLIMATE CHANGE

Pollution from cars can cause immediate and long term effects on the environment. The car emits a wide range of gases which causes global warming and acidic rain harming the environment and human health, engine noise and fuel spills from a car can also cause pollution. cars, bikes, trucks and other kinds of transportation are one of the major cause of air pollution. Pollution emitted by a car is one of the major cause of global warming, cars emit carbon dioxide, hydrocarbon, nitrogen oxides, and other greenhouse gases. Greenhouse gases trap heat in the atmosphere, which can cause a temperature rise in the atmosphere in the world. Without having greenhouse gas, the world would be covered in ice, but burning excessive amount of fossil fuels like gasoline and diesel, have caused 0.6 degrees celsius rise in the overall temperature around the globe, and it is expected to keep rising in the future. Global temperature getting warmer can cause harm and affect in agriculture, wildlife and natural creations.

The damages caused by pollution from cars are widespread, it affects air, water and soil. Nitrous oxide emitted from a car contributes in expanding the hole in the ozone layer, which shields the earth from harmful UV rays from the sun, sulfur dioxide and nitrogen oxide emitted from a car contributes in creating acidic rain, which can heavily damage forest, agriculture, and buildings. Acidic rain can make water acidic, it majorly impacts on the lake, streams and river water, which makes its final way to the sea. Acidic rain mixed with water can cause the water to absorb aluminum from the soil, it causes impacts of life of clams, fishes and other aquatic species. Even though some aquatic species can tolerate living in acidic water,

however in an ecosystem, it can impact on some species which can lead to an impact on many more species in the food chain which includes non-aquatic species as well, like birds.

The damages caused to the wildlife and forest due to acidic rain especially located at higher elevations can be worse. Acidic rain can rob all the essential nutrients in the soils and release aluminum into the soil, which makes it hard for trees to seep in water, leaves in trees can also be harmed by the acidic rain. The impacts caused by the acidic rain to the nature combined with other environmental disasters, results reduced capacity to withstand cold weathers in trees and plants. Pollutants may also hamper down trees ability to reproduce, reducing the growth of nature. Though some soils have a greater capacity to neutralize the acids than others, soils that have less neutralizing capacity has greater harmful effects caused by acidic rains. While this is the reason for the government to make stricter emission norms to curb down the pollution rate in the world and pushing manufacturers to produce more environmental friendly vehicles like electric powered cars and hybrid assisted gasoline engine, to encourage and engage the buyers towards these vehicles, incentives are being offered by the government.

8.15 FUEL CRISIS

The fuel crisis is a problem which occurred back in the 1970s, which brought the prosperity to the electric powered vehicles to be a replacement for the internal combustion engine vehicles and a fix for the fuel crisis issue. But after resolving the issue and the increasing practical difficulties and problems with the early electric cars, gasoline powered internal combustion engine was brought back into the limelight, but as the sales of cars increased, the usage of fuel increased. The Increase in the use of fuel created demand for the gasoline increasing prices, by this time the consumers started to prefer compact cars with considerably smaller downsized engines providing better fuel economy. That evolution made the compact car segment flourish, every car manufacturer focused on the compact car segment. The engines were downsized from naturally aspirated V8 and V6 sedans were replaced with a V4 turbocharged engine which helped in extracting better fuel efficiency without compromising on the performance of the vehicle. While performance sedan was replaced with turbocharged V8 from naturally aspirated V10's which helped in gaining power without compromising on fuel efficiency. As this was the first

solution found by the car manufacturers, while on the other side the electric cars started selling in considerably higher numbers after the launch of Tesla Model S in 2012, with all the technical advancements and an electric motor that is capable of out beating a gasoline internal combustion motor cars, by every standard like performance and fuel efficiency.

Tesla kept developing more technologies, upgraded motors and better models for their brand, with the launch of model X Tesla took over the electric cars segment, with industry first technologies and performance oriented motors options that were never seen before from an electric automobile. While the gasoline-powered automobile segment saw more of a hybrid assisted internal combustion engines, which helped the internal combustion engine cars to score high on both fuel efficiency and emission standards as well. The fuel crisis helped in turning the automobile industry towards producing technologically advanced engines and drive trains to deliver better performance than a naturally aspirated V8, V10 and V12 Engines from a smaller turbocharged or supercharged V4's and V6's motors without impacting much on the fuel efficiency. The automobiles have come a long way when it comes to designing and engineering of an automobile, from been having a heavy body and a big motor to extract best performance, automobile has evolved into producing cars that is powered by a V4 turbocharged engine that is more capable than a V8 powered car of the same class 20 years back. Now in a performance car, everything matters from the body shell being aerodynamic, engine, transmission, suspension and the wheel drive systems a car uses. These Systems help in making a performance car capable of driving, handling better yet efficient than its predecessors.

These changes made in the industry helps in keeping the internal combustion engine cars alive. As for a car enthusiast, there is nothing that can replace the performance and sensation that an internal combustion engine can deliver. For the future, the sports/supercars are planned to powered by hybrid or an electric motor, that can provide the performance of an internal combustion engine yet being environmental friendly, Ford has teased that they're flagship sport pony car, the Mustang, powered by a hybrid motor. As the fuel prices increase due to high demand and economy changes, the future of automobiles engine is heading towards electric, not only for the fuel crisis issue but also for the environmental sake.

8.16 ROAD SAFETY

Road safety is one of the main concerns, because in the recent day's deaths and injuries caused in road accidents is one of the major social concerns. If necessary action is not taken it can lead to an 80% increase by the year of 2020. This issue is due to increased accidents due to over speeding and lack of attention to driving, as the road accidents increased, the governments started to pay attention to increasing the road infrastructure and safety features in a car to prevent or protect the occupants from a tragic collision. These deaths of people can lead to an economic loss of the country imposing uncertainly, to low and medium income country. This can lead to adverse effects on economic and social development, value of populace and virtue of a country.

This forced countries to pay attention in fixing the issues by strengthening the road safety laws and improving vehicles safety standards to protect the occupants in case of an accident, serious test on automobiles have been conducted by crash test, the reports of a crash helps the manufacturer to improvise their automobile to license their products for sale with the set safety standards by the government. It begins from the chassis rigidity, body shells flexibility and capacity to handle impacts, adult occupant protection, child occupant protection, pedestrian and cyclist protection and safety assist technologies provided like driver assistance and cars avoidance systems, these are the criteria, which the ratings in a crash test depend on. Strengthening the overall standard safety features have been implemented such as seat belt reminders, dual airbags, ABS and EBD and the latest addition to the line up of standard safety features include Speed Alert System. The view of the driving person is changed to be cautious on the four sides to look upon making way for self inclusively and move on that this system dissolves traffic regulation too. Overtaking should not be felt as a tease, it is warranted for the vehicle moving in the front of their own pace. This built of confidence avoids the friction and shear drag imposed on the vehicles plying by.

These safety aids are introduced in order to reduce potential deaths in case of a crash, the latest addition on standard safety systems in India, speed alert system will help in reducing the and avoiding the accidents caused due to speeding, because over speeding (beyond the capacity

to control by self) is one of the major cause of crashes in the world. GPs added with camera facilitates rear view that rear view mirrors could be removed giving the car a compact assemble.

Accidents occur mostly due to lack of attention to speed or speeding, and here's where the newly introduced in India speed alert function comes to play, when a car reaches speeds above 80Kmph, The system alerts the driver by an audible chime and it continues to do so for every minute till the driver drops the speed and when the car crosses the speed of 120Kmph the system with continuously give a audible chime, which is to irritate the driver which forces to slow down below 80Kmph, when asked about the system to the road transport ministry, they said, it is a the nuisance that the system delivers which forces the driver to drop the speed, and the system has been made to be a standard safety equipment in all cars sold in India within July 2019, the system cannot be removed or overridden. And the function of the system has been briefly explained in present automobile industry chapter under the title of safety features. Anyways the lanes which permit the high speed to which the car is designed too will get the alarm that makes it less functional.

Numbers of safety assistance features are being introduced in the automobile and the features that have been in the expensive automobiles are being produced at an affordable cost, that is being introduced in the Entry Level segment cars to strengthen the safety aspect of the automobile to induce confidence in the usage of an automobile. Though these systems can fail at times it has also proven in the fact that it serves the purpose of the invention. The cars produced in recent days are definitely safer and overall better built compared to their predecessors. In terms of the improvisations made in the road infrastructure by the government.

8.17 VEHICLE POPULATION

Vehicle population is one of the growing issues. As the population of vehicles increases it can affect in so many different levels, from increase in traffic, increase in pollution, increasing the demand for fuel, increase in accidents, destruction of landscapes in order to widen the roads to accommodate cars and reduction in use of public means of transport such as train and bus. The population of cars started to increase specifically after the introduction of compact car. It

offered everything that a daily commuter would ask for, yet being cheaper in terms of cost. The finance offered by banks with low rate of interest made purchase of cars easier for low and middle-income consumers. It helped in raising their standards of goals in the world, but excessive purchase of cars in the same house lead to locking the use, making them stand still and that it reserves a huge sum of money which otherwise would get into just investments. This is one among the deeds which is being done without realizing why that cannot be stopped too that the automobile industry is considered to be progressive giving jobs to many, giving more variants to the core of user defined cars, thus increasing the longevity. Unlike the trend as the price decreases as the use of age of the vehicle increases, for the user value it possesses the value would increase than the purchase value but lower than the current pricing. It is natural the new models are sleek and light weight ever that the old ones are felt solid and ever get it again sort of. Standing still in a traffic lead to increased rate of pollution and global warming, when a car is idling the engine consumes more fuel, which leads to the demand for fuel, increasing the fuel prices. So increase in population of cars does not end with the increase in number of cars in the environment but leads to so many different issues. Population of cars is expected to be doubled by 2040. From a survey report, these changes in the time period is mostly going to occur in India and China, both the countries are set to see a rise by another two billion in the global population in the next 25 years. More of variants with air boost technology and user defined models, the increase in population of car accounts to more to one and that shows the value one possess, as an artifact. This then takes the shift from a commuter, transport media to a possession, a pride factor and an artifact. Further development on this would result in less production and consequently the cycle repeats. What withstood of all these changes would sustain, making it progressive is the task of manufacturers ever for the brand value has its own impact either way.

Growing Gross Domestic Product (GDP) in the said countries can lead to a demand for automobiles, air as an alternate for boosting velocity and acceleration that those which were seen as luxuries earlier becomes basic and eternal. As the growth in population of cars is going to be seen in the future, problems like pollution, traffic, global warming and demand on gasoline is also expected to increase or demand focus to be kept regulated below prescribed standards that the research in this arena will be more booming than ever and growth progressive too for the constraints are no longer the impossible to get lifted, but very much possible to get done

naturally, basically too. The core is how you view a problem, are to which conviction you move to resolve an issue. When there is boom and drift, the demand makes not only the buyer go blind and crazy, but all the stake holders including researchers that they knot down the feedback and setbacks as constraints till this time.

These are reasons behind car manufacturers designing cars powered by electric motors to reduce pollution and demand on fuel and leaning towards designing a flying concept car to reduce traffic on roads and reduce destruction of the nature to widen the road in order to accommodate the increasing population of cars. As the electric powered automobiles start taking the mainstream sales, problems like fuel crisis and pollution will return back to its normal phase, and gasoline powered internal combustion being hybrid assisted, will help in reducing the pollution rate by stopping the engine when its left at idle, this will also help in reducing the wasting fuel and help in increasing the fuel efficiency, lowering the demand of fuel will help in getting fuel at a considerably cheaper price and reducing fuel scarcity, including the regeneration rate into consideration as prime factor in the sustenance of automobile industry. As the growth of automobiles is impossible to control as it became as a permanent part of a human's day to day life, the destruction caused due to an increased population of automobiles can only be reduced by finding an alternate solution, not reflecting of reduced sales. For increasing traffic, however, automobile companies are finding concept technologies to overcome by inventing flying car concepts. The government is working on widening the roadways to accommodate the capacity of automobiles on road for the future. Widening the roadways is not a simple task the destruction made to create more space for cars can be high and dangerous, from demolishing the natural landscapes, invading the wildlife and destroying shops located on the side the roadsides.

The destruction of natural landscapes might not sound like a major impacts but it is when considering the nature is being destroyed in the road widening path, trees and other greenery natural elements to small mountains being destroyed, invading the wildlife as the width of the roads starts to increase in a forest the wildlife animals life are being disturbed , It can cause serious damage as it does not stops with disturbing them but it also disturbs their livelihood by destroying trees and plants that they are being fed with, as humans starting to intervene in their environment they start to move towards the city, the reason why animals like elephants are being

found in the city in search of food, also the roads through forest can reduce the natural air by increasing pollutants chemicals into the forest through transportation medias like trucks, bus, cars, and motorcycles. The chances of road mortalities due to automobiles while animals crossing the road can increase, by the same, the population of animals can decline, and it has been found to be one of the leading cause of decline in some of the animal population. Also destructing natural elements like trees and plants can reduce the natural wealth in the world and can cause environmental issues like reduction in rain, and increasing global warming. Destruction of shops located on the roadsides, is one of the common problems caused when widening the road inside city in India, as the Shops are forced to be torn down in order to make space for expansion of the road and is a resettlement and rehabilitation issue that burdens the government and society.

Increase in population of cars and other automobile has helped in upgrading human's day to day life by adding comfort and convenience, but at the same time in the growth it is in now can cause a lot more distraction to the environment and the wildlife. This makes for the reason why the government and the automobile manufacturers are keen on producing ecological vehicles for the future in order to reduce issues like pollution, global warming, and acidic rain. Also focusing on flying car concepts, in order to reduce traffic and reduce the destruction caused due to road expansion to accommodate cars in the future and reduce traffic congestion. Automobiles are not just industry and business but it also holds responsibility for human development in line with the future of the environment. Predicting the future by today's growth in the automobile industry and upgrading the automobiles to not let the destruction occur helps in preserving earth, stopping the nature's mishap. E governance, work from home environments also help to balance the above said factors.