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3.b. Motorsport Is the forefront in vehicle technology.

As technology is developed for racing applications, these technology is often used for everyday vehicles. An example of technology in everyday vehicles that is developed for motorsport are: Automatic gearbox (DSG), Suspension, Tires, brakes, Air intakes, Dual overhead cams, Materials (Carbon fiber) Safety Aero, turbocharging etc. There are new technology that's being used in motorsport that will be used on future cars. An example of this is F1 with "KERS" which stands for kinetic energy recovery system. This system takes the kinetic energy and converts it into electrical energy which is stored in the battery. This has the added affect in slowing down the vehicle.

Another technology that's being used on F1 cars that originated for racing is reducing engine displacement and increasing VE by adding a turbo. Battery technology is increasing as a result of formula E. This is due to the increased need of battery capacity. All of these examples show the importance of using motorsport to develop technology. This view isn't shared by the public due to the amount of pollution motorsport creates. This perception is affecting the motorsport industry so much that more environmental techniques are employed like alternative fuels and hybrid technology.

Motorsport also affects the perceived noise levels of a vehicle. This is shown with the development with exhaust, intake and tires. This technology is used on everyday vehicles.

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2.a. A end of life process starts with the depollution process. This process involves removing hazardous materials like the battery, fuel, oil, coolant, brake fluid and any other potentially substances. This is then disposed of correctly or recycled. All of the gravity holes are then plugged to reduce further pollution. The vehicle is then dismantled into its singular components. For example engine is removed for the aluminium, wires are removed for the copper, plastics is separated ect. Once separated the individual components are shredded. In the case of steel components, Magnetic separation is used to separate the non ferrous materials from the ferrous steel. For smaller refinements, a sink float separator is used to separate the light plastics from the heavier plastics and metals. The light plastics float but the heavier materials sink. The heavy particles are then separated further using a Eddy current separator which separates the small ferrous steel from the plastics. Each material that is separated from the vehicle is recycled and refined into new products, vehicles or buildings.

Electric cars have additional steps because of the lithium batteries. Often old batteries are reused. Due to the reduction in capacity for the vehicles makes it inefficient but is still functioning so these batteries are used for home energy storage like Festo's powerwall. If the battery is defective then the battery is recycled. Batteries have steel, copper, aluminium, plastic, cobalt, Manganese, Lithium and nickel which all can be refined and

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Recycled. Due to there not being alot of battery recycling plants, recycling batteries are expensive and isnt profitable.

A vehicle has many different materials which the majority can be recycled. The average vehicle Composes of:

Material	% by weight
Ferrous Metal	68.3
Plastic	0.1
light non-ferrous metal	6.3
tires	3.5
Glass	2.0
fluids	2.1
rubber	1.6
Heavy Non-ferrous metal	1.5
Other	1.5
battery	1.1
Process Polymers	1.1
Electrical/electronics	0.7
Carpet	0.4

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2.b. Autonomous vehicles have five levels of autonomy. These levels range from no automation to fully automated. These levels are as follows:

Level 0 - No automation

Full time execution of driving tasks by a human driver, even when enhanced by warning or intervention systems. e.g. ABS, front collision warning, blind spot

Level 1 - Driver Assistance

Driver assistance of either steering or acceleration/deceleration but only under a specific scenario. e.g. Cruise Control, lane assist, park assist.

Level 2 - Partial Automation

Multiple driver assistance systems of both steering and acceleration/deceleration only under certain scenarios. e.g. Adaptive Cruise Control, lane keep assist and Autonomous park assist

Level 3 - Conditional Automation

Multiple driver assistance systems of all aspects of the driving tasks, however the human driver will respond to a request to intervene only within a specific driving scenario. e.g. Road train, Tesla's Autopilot

Level 4 - High Automation

Multiple driver assistance systems of all aspects of the driving task, even if the driver doesn't respond to a request to intervene only within a specific scenario. e.g. Valet parking, Highway Pilot

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Level 5 - Full Automation

Full time execution by Multiple driver assistance systems of all aspects of the driving tasks, under all roadway and environmental conditions.
e.g. Robot Taxi, Google car.

If vehicle automation is implemented, the vehicle industry would be affected dramatically due to the main development being focused on high tech systems like Artificial Intelligence Powertrains systems are also affected because ICE engines will be replaced with electric systems. If Level 4 or Level 5 systems are perfected, the ownership of personal vehicles will be in the past. Car rental like taxis will be used more prevalently meaning it will essentially become autonomous taxis which will affect the taxi industry. The advantage at this is that transportation can be more accessible for people as well as reducing travel time because of reduced accidents and congestion. This can also reduce CO₂ emissions due to the reduced fuel consumption which could reduce travel costs. Parking would become easier because the vehicle can park further away. The expense of all of this is that it's expensive to develop and make at the moment due to the lack of knowledge and resources.

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Implementation of Automated Vehicles Levels 3-5 could have issues due to different factors. There is safety concerns due to the software and security of the software. Due to the amount of wireless systems on the vehicle like bluetooth, telecoms, ITS roadside stations ect. all could be hacked.

An example of this is Jeep where all the electrical systems can be controlled remotely which could endanger the occupants. The main issue with automation is the ethical standpoint. The Autonomous vehicle lack a moral code. An example of this is "the Trolley Dilemma". The trolley dilemma states, if a vehicle is traveling down a road and is about to crash, but has to choose between hitting one person or several, what does it choose?

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3.a. There are many different noise limiting measures that can be employed. The one stated is limiting the loudness of the vehicle to 100dB. This is done by testing the vehicles in a designated testing area. Brands hatch employ this method by testing the vehicles before the race to ensure it conforms to the required noise limit. If a vehicle exceeds the limit, then the vehicle isn't allowed to race unless fixed. This is an issue because most vehicles remove this fix once certified. This is why brands hatch monitor the race to ensure that the cars conform to the rules.

An introduction of noise reducing features are often employed. These include fences, tall structures, bunds or foliage. These are often more expensive and alternatives are often explored first. An example of a track that use these features is penrhy where they have bunds around the track.

Track modification is also used to reduce noise. This means that the circuit layout is changed to ensure that the noise levels reduce. For example a long straight can often be reduced by adding a corner to reduce the vehicles speed. This was adopted by Castle Combe where the straight was reduced.

Limitation of track activities to certain hours or days ensures that the overall noise pollution is reduced throughout the year. This ensures the local residents don't complain as much. Castle Combe also employ these measures.