

P 1.2 Refine your research

5 Keywords of phenomenon: an alternative of automobile - Electric Vehicles (EVs)

1. Electric Vehicles (EVs)
2. Battery
3. Metals
4. Gasoline
5. Automobile

Electric Vehicles (EVs)

1. What is Electric Vehicles?

Electric vehicles is "a vehicle that uses one or more electric motors or traction motors for propulsion."
- *Wikipedia*

2. History of Electric Vehicles

1800s

1828 First Small-Scale Electric Cars

1889 First Electric Vehicle Debuts in U.S

1890 Electric Cars Reach Their Heyday/ Edison Takes on Electric Vehicle Batteries

1920 Decline in Electric Vehicles

1968 Gas Prices Soar

1979 Interest in Electric Cars Fades

2006 Silicon Valley Startup Takes on Electric Cars (Tesla)

2013 Electric Vehicle Battery Costs Drop

2014 Electric Vehicles and a Multitude of Choices

2020s

Battery

1. What is Battery?

A battery is "a device consisting of one or more electrochemical cells with external connections or powering electrical devices such as flashlights, mobile phones, and electric cars." - *Wikipedia*

2. Development of Battery

1700s

1765 Watt (UK) invents the Steam Engine

1800 Volta (Italy) invents the battery

1868 Leclanche (France) invents original version of today's dry batteries

1899 Jungner invents nickel-cadmium storage battery

1969 Ultra high-performance dry battery production launched in Japan

1992 Mercury-free alkaline dry batteries achieved / Lithium-ion batteries developed

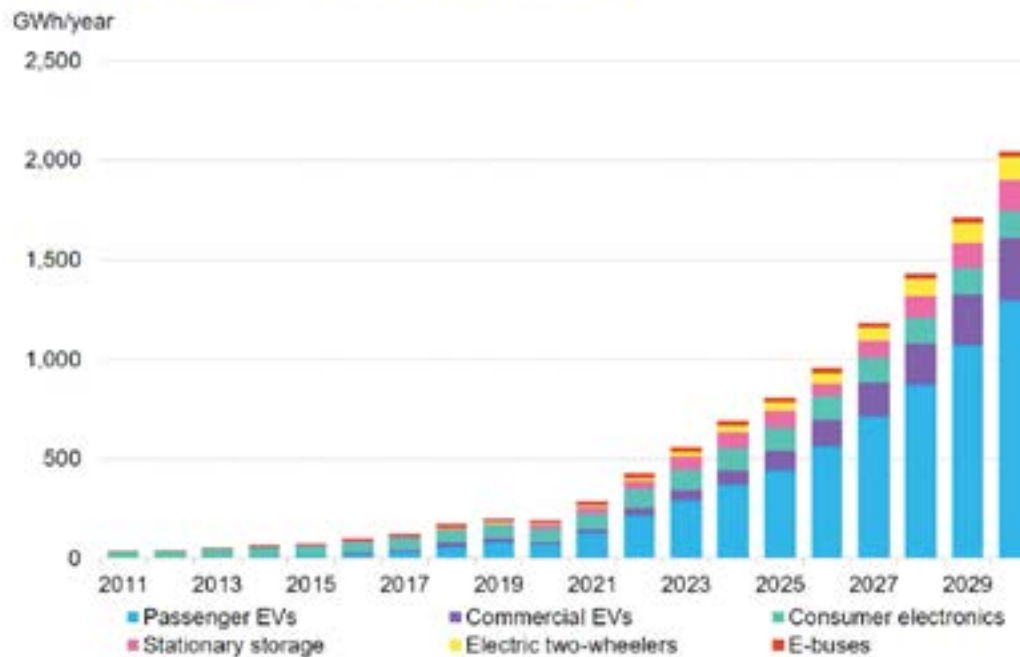
2005 envelope nickel-metal hybrid rechargeable batteries released

2010s

3. How battery is used?

Batteries grow 10x by 2030

Forecasted demand for lithium-ion batteries



Metals

1. Metals used in Battery

- Lithium
- Cobalt
- Nickel
- Manganese
- Graphite
- Aluminum
- Copper

Gasoline

1. What is gasoline?

Gasoline is "a clear petroleum-derived flammable liquid that is used primarily as a fuel in most spark-ignited internal combustion engines." - *Wikipedia*

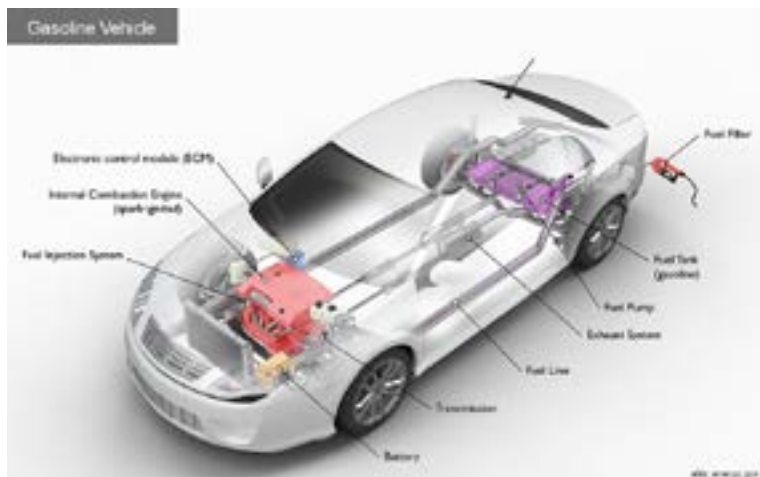
2. Gasoline types

Leaded vs. unleaded gasoline

Ethanol in Gasoline

3. How gasoline works in cars?

"A gasoline car typically uses a spark-ignited internal combustion engine, rather than the compression-ignited systems used in diesel vehicles. In a spark-ignited system, the fuel is injected into the combustion chamber and combined with air. The air/fuel mixture is ignited by a spark from the spark plug. Although gasoline is the most common transportation fuel, there are alternative fuel options that use similar components and engine systems." - *Alternative Fuels Data Center*



Automobile

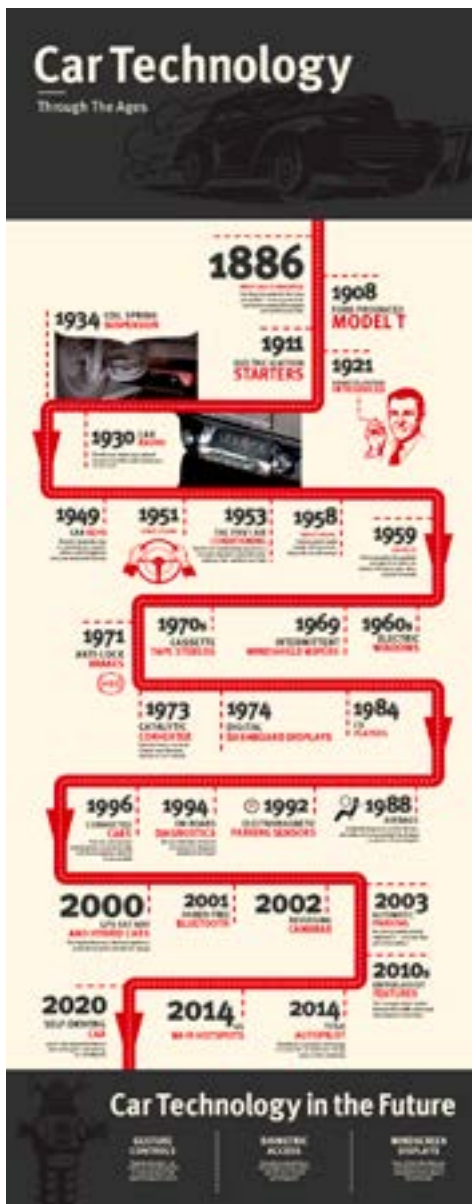
1. What is automobile?

An automobile is "a wheeled motor vehicle used for transportation." - *Wikipedia*

2. Important timeline of automobiles

animal engines (Horse) - wheels (carts) - gears - steam engines (Watt) - Diesel Engine (Rudolf Diesel) - Henry Ford (Model T/ Assembly line) - (developments in gasoline cars) - self-driving cars - electric cars

3. Technological Development of Cars



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