

# Electric Vehicle impact on Oil Operators in Five – seven Years Harvard Case Solution & Analysis

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## Criteria

1. All the stakeholders have a job, and there is no disruption in any country's economy.
2. Quality of environmental stewardship and overall population's health is increased.
3. Finding a purpose for the non-renewable resource used in fossil fuel cars (gasoline) that does not produce harmful gases.
4. Proper recycling of lead-acid batteries.

## Impact

**Environmental Impact**  
The transition to electric vehicles (EVs) has significant environmental implications. EVs produce zero tailpipe emissions, which reduces air pollution and greenhouse gas emissions. However, the production and disposal of EV batteries can have environmental impacts. The recycling of lead-acid batteries is a critical issue that needs to be addressed.

## Fossil Fuel Cars

Fossil fuel cars are powered by internal combustion engines. They emit greenhouse gases, which contribute to climate change. The technology used in fossil fuel cars is well-developed, and they are easy to use. However, they are not as efficient as electric cars.

## Electric Cars

Electric cars are powered by batteries. They produce zero tailpipe emissions, which is a significant advantage over fossil fuel cars. However, they are more expensive and have a shorter range than fossil fuel cars. The technology used in electric cars is still in the early stages of development.

## Solution

1. Regulate the production of gasoline and the production of fossil fuel cars. This will ensure that the industry is not too large and that the environment is protected.
2. Regulate the production of electric cars. This will ensure that the industry is not too large and that the environment is protected.
3. Regulate the production of lead-acid batteries. This will ensure that the industry is not too large and that the environment is protected.

## Chemical Process

**Internal Combustion Engine**  
Spark Ignition Gasoline Engine  
(Fossil Fuelled Car)  
$$C_8H_{18} + 12.5 O_2 \rightarrow 8 CO_2 + 9 H_2O$$
  
**Battery Powered Lead Acid Battery**  
(Electric Car)  
$$Pb + PbO_2 + 2 H_2SO_4 \rightarrow 2 PbSO_4 + 2 H_2O$$

## Stake Holders

Fossil fuel cars provide a significant source of revenue for oil companies. They also provide a source of revenue for the automotive industry. The transition to electric cars will have a significant impact on these industries.

## Factors

- 98% of driving population drives a vehicle that runs on fossil fuels.
- Would take 20 years to transition from FFC to EV.
- The industry of fossil fuel cars is a big industry and supplies many people with jobs around the world.
- Some countries rely on the exports of such fossil fuels (gas and oil).

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3. Finding a purpose for the non-renewable resource used in fossil fuel cars (gasoline) that does not produce harmful gases.
4. Proper recycling of lead-acid batteries.

## Impact

**Harvard Business School**  
Case Study  
Electric Vehicle impact on Oil Operators in Five – seven Years  
The Case Study is a Harvard Business School Case Study. It is a case study that discusses the impact of electric vehicles on oil operators. The case study is a Harvard Business School Case Study. It is a case study that discusses the impact of electric vehicles on oil operators.

## Fossil Fuel Cars

Fossil fuel cars are cars that run on fossil fuels. They are cars that run on gasoline, diesel, or natural gas. They are cars that run on fossil fuels. They are cars that run on gasoline, diesel, or natural gas. They are cars that run on fossil fuels. They are cars that run on gasoline, diesel, or natural gas.

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## Solution

1. Improve the fuel efficiency of fossil fuel cars. This can be done by improving the engine, reducing the weight of the car, and using lighter materials. This can be done by improving the engine, reducing the weight of the car, and using lighter materials.
2. Find a way to use the non-renewable resource. This can be done by finding a way to use the non-renewable resource. This can be done by finding a way to use the non-renewable resource. This can be done by finding a way to use the non-renewable resource.

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## Stakeholders

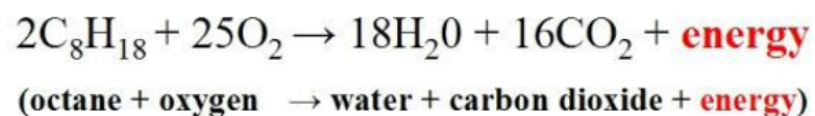
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## Factors

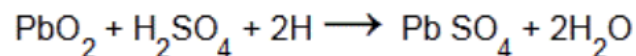
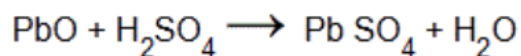
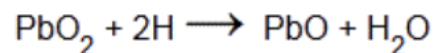
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# Chemical Process

Internal Combustion Engine;  
Spark Ignition Gasoline Engine  
(Fossil Fueled Car)



Battery Powered; Lead-Acid Battery  
(Electric Cars)



# auto

$\text{PbO}_2$

Reacts with sulfuric acid to form lead sulfate. Must supply electrons and is left positive

$\text{H}_2\text{SO}_4$

$\text{H}_2\text{O}$

Reacts with sulfate ions to form lead sulfate. Pb supplies two positive charges and lead electrode is left negative

Pb

## Fossil Fuel Cars

- Fossil Fuel cars run on an internal combustion engine.
- **Internal Combustion Engine:**  
an engine that generates motive power by the burning of gasoline, oil, or other fuel with air inside the engine, the hot gases produced being used to drive a piston or do other work as they expand.
- Pros :
  - The technology used to harness the energy of fossil fuels is well developed
  - Cars that run on fossil fuels are generally cheap
- Cons:
  - The fossil fuel; gasoline, that these cars run on contributes to production of CO<sub>2</sub> which causes global warming
  - Gasoline is also not a renewable resource



## Electric Cars

- Electric cars run on lead-acid engines (battery powered engines)
- **Lead-Acid Engines:**  
A type of battery that uses plates made of pure lead or lead oxide for the electrodes and sulfuric acid for the electrolyte
- Pros
  - Cheaper to Operate: No oil changes since the cars do not have an exhaust system. Maintenance costs are reduced. Electric cars maintenance includes rotating the tires and making sure they are always inflated. Given the considerable efficiency of electric cars compared to internal combustion models, the cost per mile to fuel an EV is approximately one-third to one-quarter the cost of gasoline (on a cost per mile basis).
  - Quiet and Quick: High torque (axle-twisting power) offered by EVs. Step on the accelerator and power is delivered immediately to the wheels, providing an exhilarating driving experience.
  - Tail-Pipe Emissions: No harmful emissions while the car is being used.
  - Gasoline Vs. Battery: Battery can be charged at home, if needed.
- Cons:
  - Limited Range: 80-100 miles of range. Take hours to recharge.
  - Long Refueling Time: Takes a couple hours to get 80-100 miles of range
  - Higher Cost: 30 000 - 40 000 dollars
  - Lack of Consumer Choice: Not too many models that consumers enjoy.



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# Impact

## Environment

The emissions from fossil fuel cars is mostly Carbon Dioxide and also a small amount of water created by the combustion of Isooctane and Oxygen. Carbon Dioxide is considered to be a greenhouse gas.

Greenhouse Gas: a gas that contributes to the greenhouse effect by absorbing infrared radiation, e.g., carbon dioxide and chlorofluorocarbons.

An overwhelming amount can cause depletion in the Ozone layer. The ozone layer is important because it is the layer of the atmosphere that is used to insulate us from the sun. If the layer is becoming thinner, then the harsh UV rays will effect us in ways such as drastically changing climate, causing natural disasters and negatively impacting the behaviour of animals and plants we depend on.

## Our Health

Global warming can cause change in snowfall and rainfall, droughts, storms and also behaviour changes in animals and crop we depend on. The natural disasters, severe storms and lack or abundance of water can cause a negative impact on our health and safety, and can lead to many diseases and illnesses and even death.

Study conducted in Stanford by scientist Mark Jacobson links the high carbon dioxide concentration in the atmosphere with the high mortality rates in urban cities. Some symptoms other than death are asthmatic symptoms and respiratory and cardiovascular illnesses.