

# Much Excite, Much Ignite

## Long Wars

**War Of Roses (1456-1467):** A series of wars that included Lanchester and York in England. Lanchester won the series of battles to acclaim the Throne Of England over York. The name comes from both of the sides badges which are white and red roses.



**100 Years War (1337-1453):** A prolonged conflict between the English and French. It was over the claims of the French Throne and territorial disputes. It ended with France's victory and showed the power of The French

**Mongol Invasions (1200-1300):** A series of military campaigns led by Ghengis Khan and his successors, resulting in the Mongol Empire's rapid expansion over the Old Lands. (Africa, Asia and Europe)

**Note From Güney:** These invasions are associated with lots of things in this curriculum and the past because WSC team loves Mongol's for some reason



**Punic Wars (BCE 264-146):** A series of 3 wars between the Romans and Carthageans. The wars ended with the defeat of the Carthageans and the victory of Romans. This war solidified Rome as a threat, a great one over the Old Lands.

**335 Years War:** It was between the Netherlands and the Sicilians. Both of the sides did basically nothing for 335 years and admitted that they forgot about it between all of the conflicts and signed a peace treaty with the sons of the Old Sicilian King because the kingdom did not exist anymore



# Things Can Explode Sometimes



## Mount Vesuvius (79 AD, Italy)

Cause: High-viscosity magma (andesitic/rhyolitic) trapped gases, leading to a massive Plinian eruption.

Result: Pyroclastic flows buried Pompeii and Herculaneum.

## Huaynaputina (1600, Peru)

- Cause: Silica-rich magma increased viscosity, trapping gases.
- Result: A VEI-6 eruption caused widespread ashfall, climate cooling, and regional devastation.

## Unzen Dake (1991, Japan)

- Cause: Dome collapse triggered pyroclastic flows.
- Result: Explosive eruptions and pyroclastic flows killed 43 people, including volcanologists.



## Tambora (1815, Indonesia)

- Cause: Extremely gas-rich magma and a massive magma chamber collapse.
- Result: Largest eruption in recorded history (VEI-7), global climate effects, "Year Without a Summer."



## Krakatoa (1883, Indonesia)

- Cause: Rapid interaction of magma and seawater (phreatomagmatic explosion).
- Result: Catastrophic explosion, tsunamis, and global climate cooling.

### Lake Nyos (1986, Cameroon)

- Cause: CO<sub>2</sub> buildup in a volcanic lake (limnic eruption).
- Result: Sudden release of CO<sub>2</sub> suffocated over 1,700 people.

### Mount St. Helens (1980, USA)

- Cause: Gas pressure buildup and a landslide uncorking the magma.
- Result: Lateral blast, pyroclastic flows, and ash fallout across the U.S.



### Eyjafjallajökull (2010, Iceland)

- Cause: Interaction of magma with glacial ice, increasing explosivity.
- Result: Ash clouds disrupted European air travel for weeks.

### Hunga Tonga-Hunga Ha'apai (2022, Tonga)

- Cause: Water-magma interaction intensified the explosion.
- Result: One of the most powerful eruptions recorded, causing tsunamis and atmospheric disturbances.



### Yellowstone (Past Supereruptions, USA)

- Cause: Massive magma chamber overpressure and gas buildup.
  - Result: Past eruptions reshaped landscapes and affected global climate.

## **Common Theme:**

All these eruptions occurred because of:

1. High gas content in magma.
2. Magma viscosity (thicker magma = more explosive).
3. Pressure buildup in the magma chamber.
4. External factors (like water interacting with magma, triggering violent explosions).

Eruptions occur when magma rises from deep within the Earth due to pressure buildup. This process is influenced by:

- Heat and Pressure: Intense heat in the mantle melts rock into magma.
- Buoyancy: Magma is less dense than surrounding rock, causing it to rise.
- Gas Expansion: Dissolved gases ( $H_2O$ ,  $CO_2$ ,  $SO_2$ ) expand as magma ascends, increasing pressure.
- Crust Fractures: When the pressure exceeds rock strength, magma forces its way out, causing an eruption.

### **A. Effusive Eruptions**

- Lava flows steadily from the vent.
- Occurs with basaltic magma (low viscosity, low gas).
- Example: Hawaiian eruptions (Kīlauea).

### **B. Explosive Eruptions**

- High gas pressure leads to violent explosions.
- Often associated with andesitic or rhyolitic magma.
- Example: Plinian eruptions (Mount Vesuvius, Tambora).

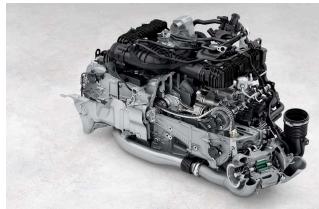
### **C. Phreatomagmatic Eruptions**

- Water comes into contact with magma, causing steam-driven explosions.
- Example: Krakatoa, Hunga Tonga.

### **D. Supereruptions**

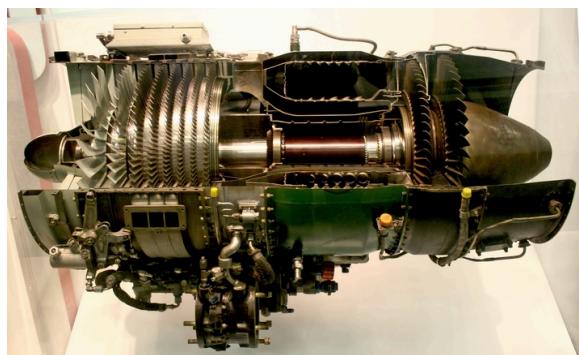
- Massive magma chamber releases vast amounts of ash and gas.
- Can affect global climate for years.
- Example: Yellowstone (past eruptions), Toba.

## Sometimes Things Start, Sometimes Don't



**Internal Combustion Engine (1680):** is a type of heat engine that generates power by burning fuel inside a [combustion chamber](#). The combustion process releases energy, which moves pistons or other mechanical components to produce motion.

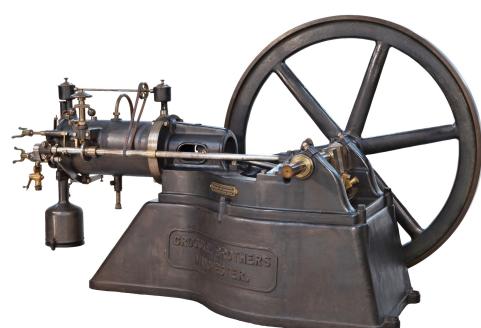
**Heat Engine (1698):** is a device that converts heat energy into mechanical work. It operates based on the principles of thermodynamics, typically by using a working fluid (like gas or steam) that undergoes cycles of heating and cooling.



**Gas Turbine Engine (1791):** is a type of internal combustion engine that generates power by compressing air, mixing it with fuel, and igniting it to produce high-speed exhaust gases. It is commonly used in airplanes, power plants, and military vehicles.

**The Wankel Rotary Engine (1924):** is a type of internal combustion engine that uses a rotating triangular rotor instead of pistons. It was invented by Felix Wankel in the 1920s and is known for its compact size, smooth operation, and high RPM capabilities.

**Otto Engine (1861):** operates on a four-stroke cycle, where the piston moves up and down twice for each power cycle. This cycle converts chemical energy from fuel into mechanical energy.



**Reciprocating Piston Engine (1876):** is an internal combustion engine that uses pistons moving up and down inside cylinders to convert energy from fuel combustion into mechanical work. The reciprocating motion of the pistons creates rotational motion through a crankshaft, which powers the vehicle or machinery.

## Types Of Engines



**Rotary Engines:** Unlike a conventional engine that uses pistons moving up and down, the rotary engine uses a rotor that moves in an elliptical or oval path within a chamber. As the rotor rotates, The rotor's motion creates three separate chambers at different stages of the combustion cycle, allowing for smooth operation and continuous power output.

**Continuous Combustion Engine:** is a type of internal combustion engine that operates on the principle of constant combustion, where fuel is continuously supplied to the engine while it is running. In continuous combustion engines, combustion happens constantly without the interruption of cycles.

## Types Of Fuels

**Hydrocarbon Fuels:** are energy sources derived from hydrocarbons. These fuels are primarily used for energy production, including transportation, heating, and electricity generation. Hydrocarbon fuels are the most common sources of energy in the world today. Hydrocarbons are the base of petrochemicals such as diesel which are crucial for engines.

- **Diesel:** is a type of hydrocarbon fuel. It is used primarily in diesel engines, which are a type of internal combustion engine that works on diesel fuel. Diesel fuel is commonly used in trucks, buses, ships, construction machinery, and in some cars.
- **ETBE:** is an oxygenated hydrocarbon compound used as an additive in gasoline. It is a type of ether and tertiary butanol. ETBE is primarily used to increase the oxygen content of gasoline, which can help reduce harmful hydrocarbons from vehicles.

**Biodiesel:** is a renewable and environmentally friendly alternative to diesel fuel. It is made from biomass. Biodiesel can be used in diesel engines without requiring major modifications, and it is sometimes blended with diesel in different proportions.

**Bioethanol:** is a renewable alcohol-based fuel made from biomass. It is a type of biofuel and is commonly used as an alternative to other fuel types or as an additive to fuels in various concentrations.

**Hydrogen:** is a new found and newly used fuel adaptation. It is made almost completely from water or components found in our world's air. Hydrogen is renewable and can be way cheaper than fossil fuels or biomass fuels.