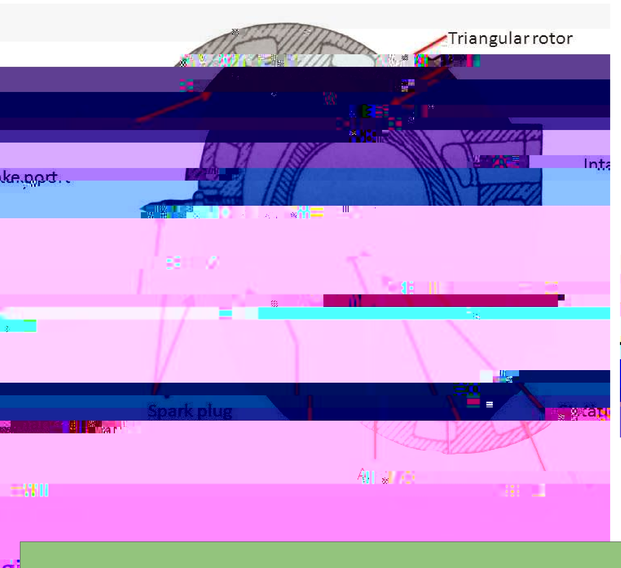

Reciprocating Engine VS Wankel Engine

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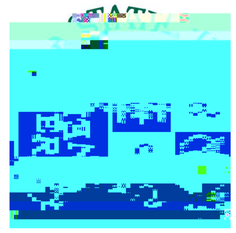


The Otto cycle is defined as an idealized Thermodynamic Cycle that describes the functioning of a typical spark ignition piston engine. It is the most common cycle found in automobile engines.

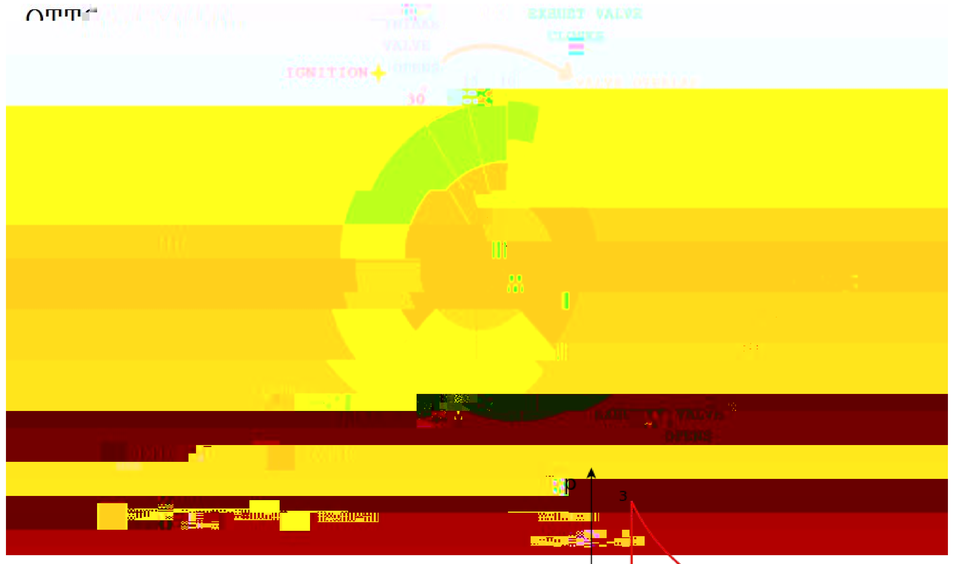
The Wankel Engine

- Designed in 1951 in Germany by Hanns Dieter Paschke based on the design of Felix Wankel
- In the design of the Wankel engine the four strokes of an Otto cycle happen around a three side symmetric rotor.
- The theoretical shape of the rotor between the fixed corners is the result of a minimization of the volume of the geometric combustion chamber and a maximization of the compression ratio.
- While a four-stroke piston engine completes one combustion stroke per cylinder for every two rotations of the crankshaft each combustion chamber in the Wankel generates one combustion stroke per driveshaft rotation, i.e. one power stroke per rotor orbital revolution and three power strokes per rotor rotation. Thus, the power output of a Wankel engine is generally higher than that of a four-stroke piston engine of similar engine displacement in a similar state of tune; and higher than that of a four-stroke piston engine of similar physical dimensions and weight.

Pros and Cons of the Wankel Rotory engine:

Pros:
- It has less parts and weighs less than the reciprocating engine
- It is more efficient in using its movement for the Otto cycle
  - Each rotor has 3 cycles running simultaneously
- It produces less vibrations and can reach rpms higher than the reciprocating engine

Cons:
- The oil level must be checked frequently due to its frequent consumption of oil
- Several components are also due to oil leaks
- Fuel consumption is power
- The engine wears unevenly due to all the combustion on occurring on one side of the housing



Pressure - Volume Graph of the Otto Cycle

- Process 0-1: Mass of air is drawn into the pistons.
- Process 1-2: Isentropic compression of the air.
- Process 2-3: Constant volume heat transfer to the air.
- Process 3-4: Isentropic expansion of the air.
- Process 4-0: Cycle completion and release of air.

Conclusion:

The Wankel engine has the potential to be a replacement for the reciprocating engine. In theory it is more efficient in the design in comparison to the weight, power, and efficiency of the reciprocating engine. This however is all in theory as of the moment. In practice it is obvious that the design of the engine is along way from reaching this effient goal. For example, the 2011 Mazda RX-8, the last mass produced vehicle with the Wankel Engine had estimated MPG of 16 city and 23 highway. Now compare this to 2011 Ford Focus which had a MPG rating of 25 city and 35 highway or the 2011 Chevy Corvette which had an MPG rating of 16 city and 26 highway. Now the Ford Focus had a displacement size about equal to the RX-8 (same size engine) and the RX-8 got blown away in the MPG department. The RX-8's MPG rating is right along side one of the biggest engines in the automotive industry. The engine of the Corvette is nearly 3x the size of the RX-8. In short the Wankel engine has a long way to go before it reaches its ideal model. The next mass produced Wankel engine is set to be released int 2017 in the New Mazda RX-9.

Special Thanks to our faculty advisor Dr. Adams

Reciprocating Engine

-The reciprocating engine was first developed during the 18th century in Europe as an atmospheric then later a steam engine.

-The reciprocating engine, or more commonly known as a piston engine, is a heat engine that is designed to reciprocate pressure from the horizontally moving pistons into the rotating motion of the crankshaft.

-Today the most common reciprocating engine is the internal combustion engine. These engines run on the combustion of diesel, LPG, CNG, and petrol and are most commonly used to power motor vehicles and engine power plants.

Pros and Cons of the Reciprocating engine:

Pros:
- The reciprocating engine is easy to maintain due to the vaste quantity of these engines out on the market. This means that parts are easier to access and techincians are easier to find
- These engines are also cheaper to make due to being the vast majority of the engines. Everything is cheaper when its made in huge quantities

Cons:
- Due to it being mostly a cheaply made quantitative product quality is sometimes compromised. Even though they are easy to repair it is needed quiet frequently
- Emissions are not very good on most of the common engines but they are getting better over time
- These engines are not as effient as the Wankel engine in terms of the Otto Cycle. It takes to rotations of the crankshaft for the piston to have a power stroke in comparison to the Wankel engine having three power strokes per rotation