



ENGINEERING ONBOARD

AEC1

**Historical
Perspective**

@yachtly.crew



Yachtly Crew

ENGINEERING ONBOARD AECI

The purpose of the Internal Combustion Engines (ICE) is the production of mechanical power from the chemical energy contained in the fuel. The fuel-air mixture before combustion and the burned products after combustion are the actual working fluids. The work transfers which provide the desired power output occur directly between these working fluids and the mechanical components of the engine.

ENGINEERING ONBOARD AECI

NIKOLAUS (Carl) OTTO

German engineer who in 1876 developed the spark-ignition engine using gasoline or petrol, though other fuels can be used. This was based on the thermodynamic cycle that is known now as the Otto Cycle..

ENGINEERING ONBOARD AECI

RUDOLF DIESEL

During the 1890s, another German engineer, Rudolf Diesel suggested that Otto's engine was fundamentally flawed in that it needed external power to operate. (the final ignition requiring a spark).

ENGINEERING ONBOARD AECI

RUDOLF DIESEL

Diesel suggested (and patented) that a better method was to compress air to such a temperature that if fuel were to be introduced, the temperature within the compressed gas would be high enough to initiate ignition.

ENGINEERING ONBOARD

AEC1

**Working
Principles**

@yachtly.crew



Yachtly Crew

ENGINEERING ONBOARD AECI

THE PETROL ENGINE

- Air and fuel mixed in the Carburettor before entering the engine
- Fuel air mix ignited by a spark
- Defined as Spark Ignition Engine (SIE)

ENGINEERING ONBOARD AECI

THE DIESEL ENGINE

Air is drawn into the cylinder and compressed to a sufficiently high temperature (450 - 500°C). Metered fuel injected under pressure, vaporises, mixes with the air and ignites.

Defined as Compression Ignition Engine (CIE).

ENGINEERING ONBOARD AECI

THE DIESEL 4-STROKE CYCLE

INDUCTION: inlet valve open, piston descending, air charge being drawn in.

COMPRESSION: both valves close, piston rising compressing the air and adding heat.

ENGINEERING ONBOARD AECI

THE DIESEL 4-STROKE CYCLE

EXPANSION/POWER: fuel injected before piston reaches the top, combustion occurs forcing the piston down.

EXHAUST: before the piston reaches the bottom, the exhaust valve opens allowing the gases to exit - piston rise to remove any remaining gases.

ENGINEERING ONBOARD AECI

THE 2-STROKE CYCLE

Invention of the two-stroke cycle is attributed to Dugald Clerk a Scottish engineer who in 1881 patented his design, his engine having a separate charging cylinder.

ENGINEERING ONBOARD AECI

IN SUMMARY

The typical 2-stroke petrol engine is used for O/B engines/jet-skis/portable power sources - generators and pumps.

Large 2-stroke diesel engines are commonly used as the major prime mover in container ships and oil tankers.

In a vessel where high speed and fast manoeuvring is required then 4-stroke diesels are generally selected.