

ACE Head Technology

“The Next-Generation fossil fuel engine”

Innovation. Clean Air. Efficient.



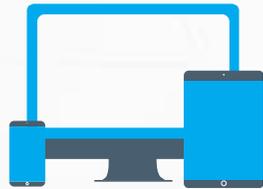
Agenda

- ▶ Our business
- ▶ Key benefits of our technology over conventional engines
- ▶ Why use ACE technology?
- ▶ How does ACE work?
- ▶ What we need



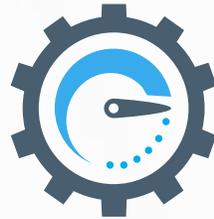
Our business

Vision: To deliver the next generation of fossil fuel based engine technology for a cleaner future



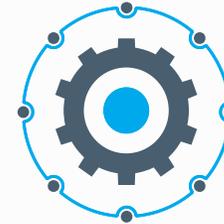
Innovation

New combustion techniques within an engine head to increase power, torque and efficiency of the fossil fuel engine



Sustainability

Lower engine emissions and increased efficiency with the aim to lower the carbon footprint



Optimisation

Leveraging existing manufacturing techniques in the production process to optimise costs

JBEC Pty Ltd Technology is protected by patents granted in Australia, USA, China with Europe and India pending applications

Key benefits of our technology

The ACE technology aims to drive the following benefits:

Utilizing existing engine designs

- Leverage lower half of existing engines
- No need to re-design a complete new engine (co-exist with existing engine designs)

Less emissions (carbon footprint friendly)

- More efficiency in fuel burn
- Reduce dangerous emissions such as particulates (nitrous oxides and hydrocarbons)
- Reduce carbon dioxide emissions

Increased efficiency

- Aiming for 50% efficiency (currently 25% in normal vehicles)
- On its own or in combination with hybrid technologies

Compatible with electric vehicles

- Can be utilized as a “clean” generator for batteries which are used in hybrid cars

Less moving parts

- No need for overhead camshaft and valves (no poppet valves needed)
- Lower cost of production (when compared to complete engine design)

Viable alternative to electric vehicles

- Projected high efficiency approaching 50% could mean a viable alternative to electric vehicles

Key benefits of our technology

The ACE technology aims to drive the following benefits:

Multi-Fuel compatible

- Able to run on Gasoline (Petrol), Natural Gas at high compression ratios

Leverages existing industry materials

- Standard spark plugs and injectors
- Standard metals used - grade aluminium, cast iron and alloy steels

Turbo compatible

- Engine is prime to take advantage of turbo-charging

Designed to operate at $\Lambda = 1$ (perfect air / fuel ratio mixture) at maximum power.

- Standard engines cannot achieve this and generally achieve maximum power at $\Lambda 0.9$ (a rich mixture)

Diesel-like characteristic

- No air throttle needed, just like diesel
- High Compression and faster and more complete burn conditions using gasoline in the engine.

Why use ACE Head technology?

ACE Head - an ability to fast track higher efficiency fossil fuel engine to 50%, through:

More Power, more torque and higher efficiency

Through more complete combustion, we achieve all 3 benefits over standard engine design

Firing technique

A unique and superior electronic *injection technique* has been developed to drive up efficiency up to 50%

Innovative Combustion chamber design

The *patented cone to oval shaped combustion chamber* ensures the fuel mixes with the intake air on induction and compression - we bring the combustion to the right part of the engine. The engine head utilises a top piston instead of a camshaft - the piston acts 'part combustion chamber, part air intake modulator'

High Compression compatible

High Compression in engines has been validated to drive efficiency up by 50% - plus enables multi-fuel types to be used

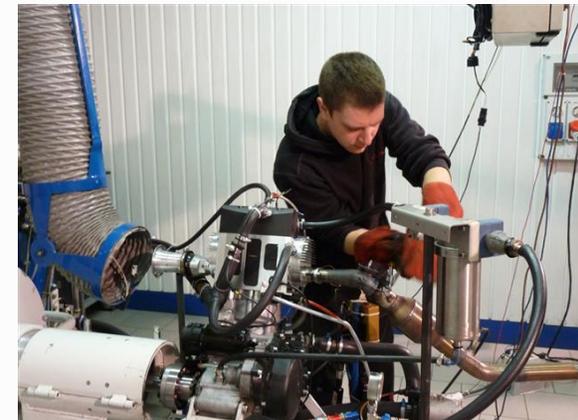
Lund University, Sweden have conducted research and testing on an actual engine using high compression gasoline (petrol) with an outcome in excess of 50% efficiency. This is a "plus" that the approach we have taken has similar merit by comparison. However the Lund University system is more complicated than ours.

How does the ACE Head work?

- **‘Ideal state’ Combustion Chamber** - design of the ACE Head aims picks up where existing engines leave off - we have designed the right environment (unique combustion chamber shape) & conditions to burn the fuel the right way
- **Unique Injection Technique**
 - to complement the combustion chamber, the design uses a **direct injected system with 2 injections per cycle.**
 - during the **full load** setting ($LAMBDA = 1$) the major injection takes place during the intake stroke forcing the air to impact the high pressure finely atomised fuel. A second minor injection is used as a small rich ignition source on the compression stroke enabling guaranteed ignition.
 - during the **partial load** setting (stratified charge) the major fuel injection is on the compression stroke with a minor injection at ignition to guarantee ignition.



Prototype has been built in Italy with Italian engine designers “Autotecnica Motori”



What we need

Investment for completion of technology in following areas:

- **Mechanical development** - mechanical changes as necessary to increase the volumetric efficiency including the addition of turbocharging (in response to Autotecnica Report). The ACE Head has a working prototype - Autotecnica Motori tested the ACE Head and we are encouraged by the results (particularly the LAMBDA=1 reading). This indicates a perfect combustion process.
- **Tuning** - dedicated dynamometer engine mapping relevant to power and emissions findings/modify to suit to enhance the findings
- **Emission metrics** - emission testing using an independent verifiable laboratory to derive the emission metrics for final sale of the technology