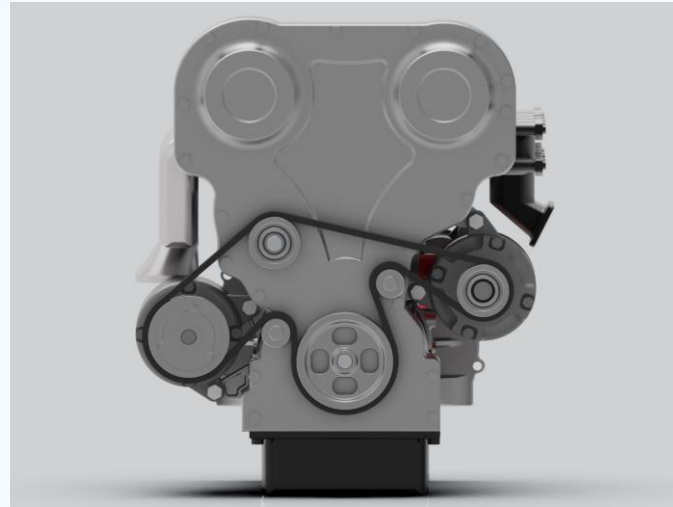


# DYNAMIC FLOW ENGINE

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 **DYNAMIC ALPHA**  
**AUTOMOTIVE TECHNOLOGY**

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# CHALLENGES IN CURRENT INTERNAL COMBUSTION ENGINE TECHNOLOGY

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- **Inefficiency**
  - Auto and light truck gasoline engines operate at 25% thermal efficiency.
  - Diesel engines in industrial trucks and machinery achieve 38% thermal efficiency.
  - Marine 4-stroke diesel engines reach 42% thermal efficiency.
  - Marine 2-stroke diesel engines achieve 48% thermal efficiency.
- **High Emissions**
  - Gasoline engines produce significant amounts of carbon dioxide.
  - Diesel engines emit high levels of nitrogen oxide.



# OUR SOLUTION: DYNAMIC FLOW ENGINE TECHNOLOGY

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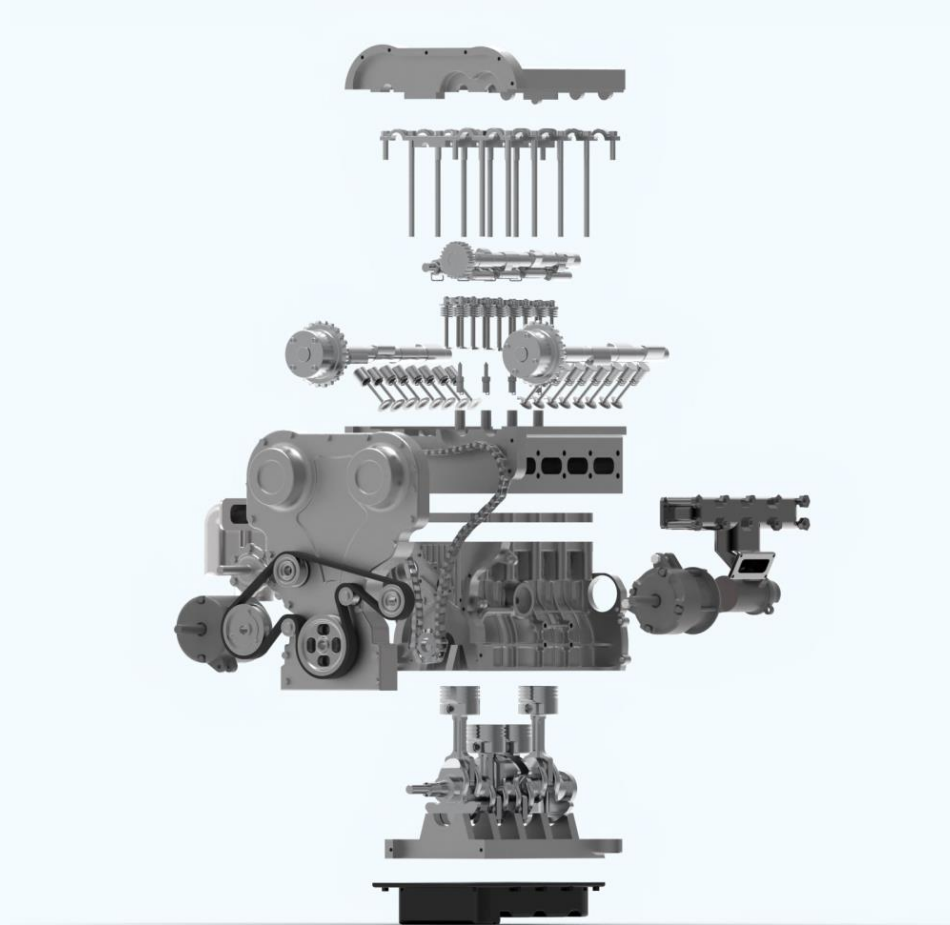
- **Efficiency**
  - Thermal efficiency of 75% across all transportation sectors.
- **Low Emissions**
  - Significant reduction in carbon dioxide emissions from gasoline engines.
  - Dramatic decreases in carbon dioxide, nitrogen oxide, and hydrocarbon emissions from diesel engines.



# INTRODUCING A REVOLUTIONARY ENGINE TECHNOLOGY

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## Dynamic Flow Engine



# KEY ADVANCEMENTS OFFERED BY DYNAMIC FLOW ENGINE

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- **Dynamic Flow Engine: Revolutionary Features**
  - **New Valve System**
    - 44% higher intake airflow and 80% greater exhaust gas outflow in a 4-stroke engine.
  - **EIVC(Early Intake Valve Closing) Atkinson Cycle**
    - Enables thermal efficiency to reach 75%.
  - **Variable Displacement & Variable Internal EGR**
    - Gasoline engines operate at peak thermal efficiency across all load, speed, and road conditions.
    - Diesel engines maintain peak thermal efficiency with significantly lower nitrogen oxide and hydrocarbon emissions.



# ADVANCEMENTS: NEW VALVE SYSTEM

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- **44% higher intake airflow and 80% greater exhaust gas outflow in a 4-stroke engine.**
  - The increased gas flow capacity enables significantly higher thermal efficiency compared to current 4-stroke engines.
  - Dynamic Flow gasoline and diesel engines can achieve thermal efficiencies of 48% or more with its unique valve system.
  - The larger airflow allows the Dynamic Flow engine to adopt more undersquare engine designs, further improves efficiency without compromising performance. This advancement makes it a revolutionary step toward achieving maximum theoretical thermal efficiency.



# ADVANCEMENTS: EARLY INTAKE VALVE CLOSING (EIVC) ATKINSON CYCLE

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- **Enables thermal efficiency to reach 75%.**
  - Eliminates pumping losses compared to current 4-stroke engines utilizing late intake valve closing (LIVC) in the Atkinson cycle.
- **Gain higher thermal efficiency without performance penalty.**
  - Supports the use of turbochargers and superchargers, enabling further improvements in power and efficiency.
  - Turbochargers and superchargers offer minimal benefits for current conventional 4-stroke engines using the LIVC Atkinson cycle.
  - Two-stroke engine valve systems are unable to utilize the Atkinson cycle altogether.
  - Incorporating turbocharging within the Atkinson cycle allows Dynamic Flow engines with Atkinson cycle to perform effectively beyond hybrid drivetrain applications.
- **Multifuel Compatibility**
  - The Dynamic Flow engine's ability to adjust compression ratios on the fly enables it to adapt compression characteristics to suit various fuels without turning engine off.



# ADVANCEMENTS: VARIABLE DISPLACEMENT & VARIABLE INTERNAL EGR

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- **Dynamic Flow Gasoline Engine**

- Gasoline engines are set to achieve substantial improvements in operational efficiency, consistently maintaining peak thermal efficiency across all real-world conditions.
- Improved efficiency leads to lower fuel consumption and reduced carbon dioxide emissions compared to current 4-stroke gasoline engines.
- The real-world thermal efficiency of small 4-stroke gasoline engines could increase from the current 25% to an impressive 75% in the future with our engine technology.

- **Dynamic Flow Diesel Engine**

- Diesel engines will significantly reduce nitrogen oxides and hydrocarbon emissions, enabling operation at a stoichiometric air-fuel ratio without compromising performance or fuel economy.
- Requires fewer emissions after-treatment systems compared to current diesel engine technologies, simplifying design and reducing costs.



# ADVANCEMENTS: VARIABLE DISPLACEMENT & VARIABLE INTERNAL EGR

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- **Enhances Reliability**
  - Dynamic Flow engines increase reliability by employing larger displacement engines operating at lower revolutions per minute under all load conditions. This approach delivers greater efficiency and durability than smaller, conventional 4-stroke engines.
- **Hazardous Environment Operation & Runaway Engine Problems**
  - Conventional diesel engines are prone to catastrophic failures during runaway events caused by external fuel vapors or internal oil leaks.
  - The Dynamic Flow engine's variable displacement technology prevents its diesel engines from experiencing runaway events.
  - Diesel engines equipped with Dynamic Flow technology can safely operate in high vapor fuel environments, completely eliminating the risk of runaway engine incidents.
  - This capability is especially useful in military operations or hazardous situations, such as those involving high fuel vapor from fuel depot explosions or damaged oil systems. The engine provides sufficient operation time to escape dangerous conditions.
- **More Capable Engine**
  - Dynamic Flow can be larger capable of producing higher horsepower and torque at low RPMs without the fuel efficiency penalty witness in current conventional combustion engine.



# APPLICATIONS

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- **Dynamic Flow engine technology improves all sectors of transportation through enhanced thermal efficiency, performance, and reliability, including:**
  - Marine diesel
  - Industrial diesel
  - Road diesel
  - Road gasoline
  - Motorcycles
  - Generators
  - Hydrogen combustion engines
  - Small airborne, sea, and land drone.



# DYNAMIC FLOW ENGINE: A PATHWAY TO FUTURE PROGRESS

