

A FLEXIBLE LOW TEMPERATURE COMBUSTION ENGINE

IITM Technology Available for Licensing

Problem Statement

- In the present era, Low temperature combustion(LTC) engines help to achieve higher brake thermal efficiencies along with lower nitric oxides(NOx) & particulate matter (PM) emissions.
- Various strategies generally known in the prior art to achieve LTC in conventional engine include Reactivity Controlled Compression Ignition(RCCI), Homogeneous Charge Compression Ignition(HCCI), Premixed Charge Compression Ignition (PCCI), High EGR LTC, Modulated Kinetics (MK) Combustion, etc. And prior art discloses that said engines capable of running **in one/two modes** and on one/two **fuels** at the most with **other deficiency**.
- Hence, there is a need for an engine, which mitigate above challenges in efficient manner.

Technology Category/ Market

Technology: Flexible low temperature combustion engine; (**Automobiles**)

Industry: Gasoline, Diesel, gaseous fuel etc.;

Applications: Passenger Vehicles, & others;

Market: The global flex-fuel engine market is projected to **\$125.9B** by **2032**, at a **CAGR** of **5.8%** during 2022-2032.

Intellectual Property

IITM IDF Ref.:1512; IN Patent No. 386517

TRL (Technology Readiness Level)

TRL- 2/3: Proof of concept, & Tested

Research Lab

Prof. Anand K, Dept. of Mechanical Engineering.

Technology

- Present Patent discloses a **low temperature internal combustion engine** capable of operating in a **plurality of low temperature combustion (LTC) modes, loads & plurality of fuels** for engine operation.

- Further said invention discloses a flexible LTC engine which could be operated under **RCCI, HCCI, PCCI, & HEGR LTC modes**.
- Said invention explains a **high-pressure fuel delivery system** mounted on said engine body for supplying fuel for combustion in said combustion chamber.
- Said fuel delivery system comprises of **two solenoid operated injectors** wherein **one** is placed on the **cylinder head**, and the other mounted on the **fuel vaporizer** in the **intake system**.
- Further, said system includes an exhaust system connected to the engine further includes a **hot, cold EGR loops & EGR Pump**, wherein EGR flow rates are regulated using **control valves**.
- And a **control system** for controlling the **injection timing, pulse width & number of pulses of high-pressure & low-pressure injectors** by effectively tracking the engine crank angle positions for a plurality of engine parameters indicative of engine load & speed. (Refer Fig. 1)

Image

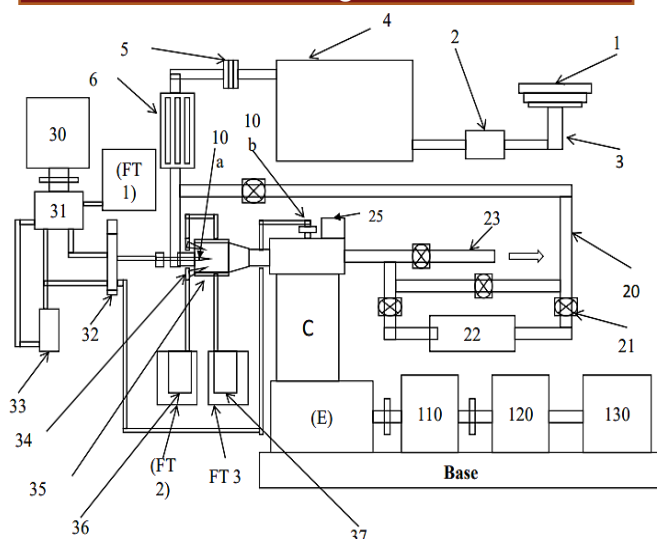


Fig.1 depicts schematic representation of a layout of Flexible Low Temperature Combustion Engine.

CONTACT US

Dr. Dara Ajay, Head

Technology Transfer Office,
IPM Cell- IC&SR, IIT Madras

IITM TTO Website:

<https://ipm.icsr.in/ipm/>

Email: smipm-icsr@icsrpis.iitm.ac.in

sm-marketing@imail.iitm.ac.in

Phone: +91-44-2257 9756/ 9719

Key Features / Value Proposition

❖ Technical Perspective:

❖ Flexible Engine operation:

- The engine could be operated with up to **three fuels** simultaneously and **could utilize both internal and external mixture** preparation systems.

❖ Independent of boiling temperatures of fuel:

- The design is flexible and thus, could be operated with **any fuel in different LTC modes**.

❖ Flexible fuel operation:

- is possible with **external mixture formation** as well as with **conventional internal mixture** formation systems.

❖ Industrial Perspective:

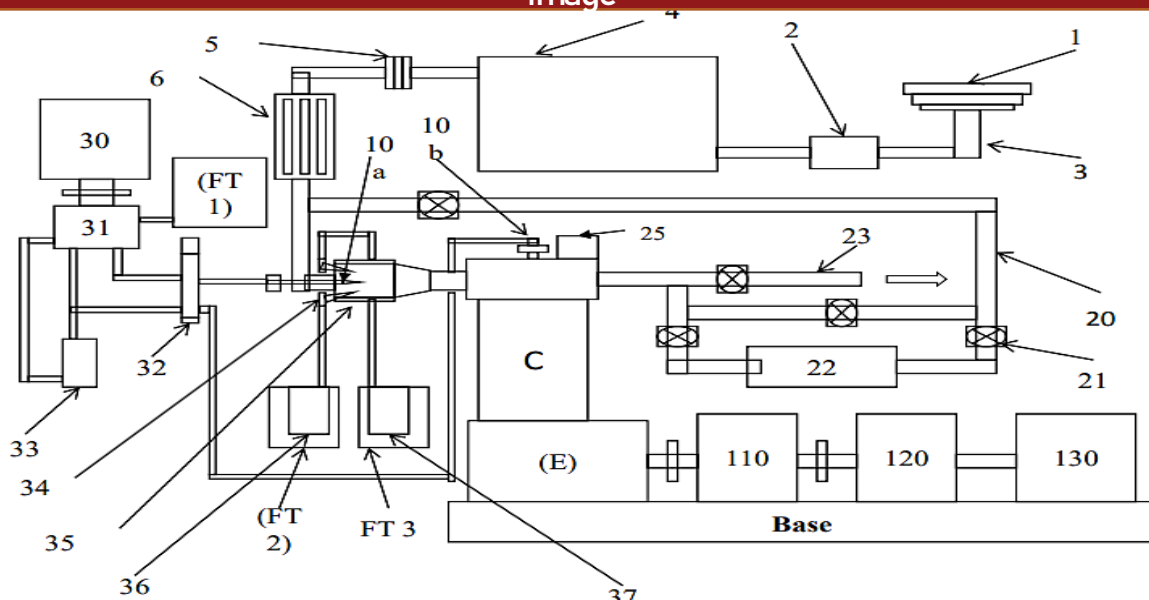
❖ Facilitates an efficient multi-mode engine capable of operating on plurality of fuels which include **diesel, gasoline, biofuels or gaseous fuels**.

❖ Provides an engine having **high thermal efficiency**.

❖ Applicable in **Passenger vehicles, utility vehicles, Heavy Commercial vehicles**.

❖ **Provide for a multi-mode LTC engine** capable of operating in parameters resulting in **lower emissions**, especially **oxides of nitrogen**.

Image



Reference: E: Engine Body C: Combustion Chamber;

1: Air Filter, 2: Air Flow Meter 3: Intake Line 4: Surge Tank 5: Flame Arrester

6: Air Pre Heater,

10a, 10b: High Pressure Solenoid Injectors,

34: Low pressure Fuel Injector, 20-cold EGR loop, 21: Control valve, 22: EGR Cooler

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IITM TTO Website:

<https://ipm.icsr.in/ipm/>

Email: smipm-icsr@icsrpis.iitm.ac.in

sm-marketing@imail.iitm.ac.in

Phone: +91-44-2257 9756/ 9719