HIGH PRESSURE INJECTION IN HEATED ANTI CHAMBER (HPIHAC), A HOMOGENEOUS MIXTURE GENERATION TECHNIQUE FOR HCCI ENGINES

IITM Technology Available for Licensing

Problem Statement

- In Internal combustion engines **in order to increase the thermal efficiency of the engine and reduce emissions**, several strategies are carried out such that homogeneous mixture preparation can be achieved through direct early injection and external injection techniques in the intake manifold.
- But to provide a controllable heating, the systems available currently are **not effective enough to achieve higher degree of homogeneity with low volatile fuels.**

Technology Category/ Market

Category –Energy, Energy Storage & Renewable Energy
Applications –IC Engines, Automobiles
Industry – Automotive
Market -**Internal Combustion Engine Market (ICE)** was a volume of **US$ 175.68 million units** in **2021** and is expected to increase to **US$ 266.56 million** units by **2029** at a **CAGR of 5.35%.**

Key Features / Value Proposition

Technical Perspective:

- ✓ Applied to **automotive engines** operated with low volatility fuels like diesel, under **HCCI mode** so as to meet the **very stringent NO_x and PM emission** mandates
- ✓ The **fuel injection pressure and the temperature** of the anti chamber surface can be **varied depending upon the volatility of the fuel** by a control system for rapidly vaporizing the injected fuel.
- ✓ The anti chamber can be also heated **by utilizing engine exhaust gas** or through the combined effects of **exhaust gas, an electric heater and engine coolant.**

User Perspective:

- ✓ The proposed external mixture preparation technique can be implemented by automobile manufacturers **with minimal changes in the intake system**

Technology

- A high pressure fuel injection system for use in an internal combustion engine comprising of:
- ***An anti chamber***
- ***A ceramic heater*** mounted on the outer periphery of the said anti chamber that heat anti-chamber
- ***A fuel injector*** positioned at the centre of the anti-chamber to ensure uniform fuel distribution along the inner periphery of the heated anti chamber
- an ***air inlet*** to the anti-chamber; and a ***control system*** for controlling the amount of fuel through the ***solenoid injector***,
- Further, the high pressure fuel injection is timed to occur during the suction stroke of the engine so as **to deliver the well mixed lean homogeneous fuel-air mixture** into the engine combustion chamber.

Further discloses a method comprising the steps of :

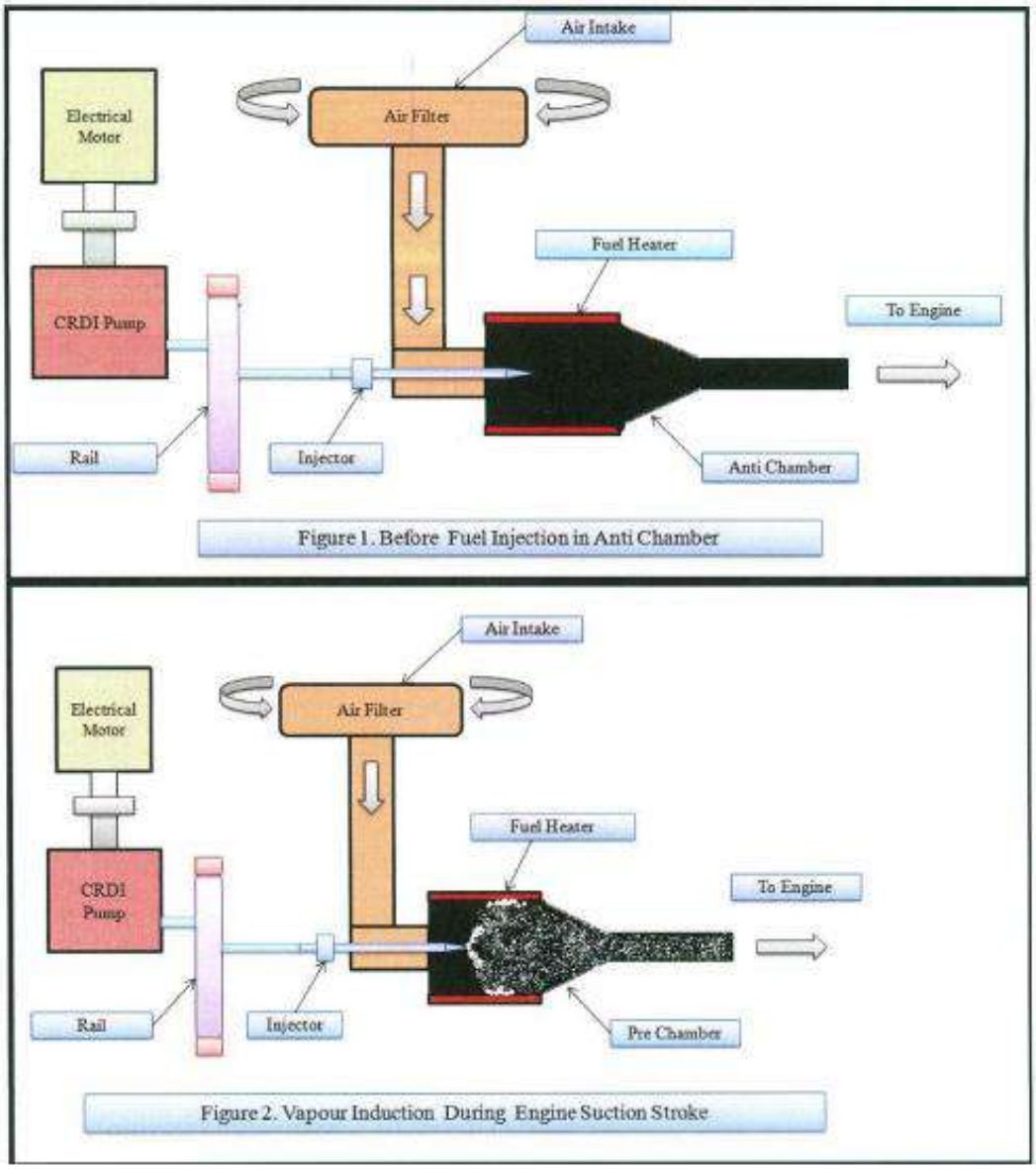
1. **Heating an anti-chamber by a ceramic heater and positioning a fuel injector at the centre of the anti- chamber for ensuring uniform fuel distribution**
2. **Inletting air inlet to the anti-chamber**
3. **Controlling the amount of fuel through the solenoid injector**
4. **Delivering the well mixed lean homogeneous fuel-air mixture into the engine combustion chamber.**

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

Images



Intellectual Property

- **IITM IDF Ref. 1513**
- **IN439412-Granted**

TRL (Technology Readiness Level)

TRL-4, **Technology Validated in Lab**

Research Lab

Prof. ANAND K
Dept. of Mechanical Engineering

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