

# Fuel Injector with Control Piston Motion Sensor

High precision detection of control piston displacement for fuel injection in internal combustion engines



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## IP Status

Patent application submitted, Provisional patent

## Seeking

Commercial partner, Licensing

## About **University of Birmingham**

At the University of Birmingham our research leads to new inventions and fuels innovation and business growth.

# Background

It is well-known that for high efficiency of the combustion engine, it is desirable to have a high level of control of the fuel injector and hence the amount and timing of a fuel injection. To measure that it is necessary to measure the displacement of the needle of the fuel injector. Although various techniques have been proposed, conventional wired sensors are generally considered impractical as there is a minimal accessibility to the needle vicinity, making it difficult to take the signal wires out of such position. The high pressure within the injector body makes it a hostile environment for taking direct measurements and leads to a fast sensor degradation.

Thus, rather than measuring the needle movement directly, it is better to measure the motion of the control piston to which the needle is attached. Currently employed for this purpose eddy sensors are majorly inadequate because they are affected by the presence of strong electromagnetic field and quite often lose data during acquisition.

## Tech Overview

The fuel injector system developed at the University of Birmingham allows high-precision detection of the piston displacement during the injection cycle. This provides precise data about the start, displacement and duration of all injection events. It can be used to accurately monitor fuel consumption information for the driver in real time. It can also be adopted by manufacturers as a diagnostic and characterisation tool. This compact and inexpensive system employs a simple sensor, consisting of a light source, an optical fibre and a detector. Using optical fibre makes the system insensitive to any electromagnetic interferences and very robust in the high-pressure environment of the injector.

## Benefits

- **Low-cost:** the injector sensor is made from off-the-shelf easily available components, **up to 10 times** cheaper than existing sensors.
- **High precision:** the signal about piston displacement is unobscured by cavitation or electromagnetic interference.
- **Sensitive:** the sensor detects equally well the main and the pilot injections.
- **Robust:** great performance at all energising and pressure conditions.
- **Durable:** the injector sensor system is made from components capable of withstanding the harsh environments of the fuel injector.
- **Flexible:** the sensor can be easily combined with the existing fuel injection system in a compact set-up.

## Applications

- Automotive engines
- Marine engines
- Gas turbines
- Power generators

## Opportunity

- Licensing
- Co-development
- Collaboration

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