

## Intake manifold measurement of “found fuel”

---

The calibration of engines at cold start remains a challenging subject. The complexity is increased by the effect of “found fuel” arising from the purging of the evaporative emissions canister and also from HCs originating from the blow-by gas which enters the intake via the (positive) crankcase ventilation system (PCV).

For some time, engineers and calibrators have been interested in quantifying the amount of fuel which is entering the combustion chambers so that they can more accurately control the combustion AFR.

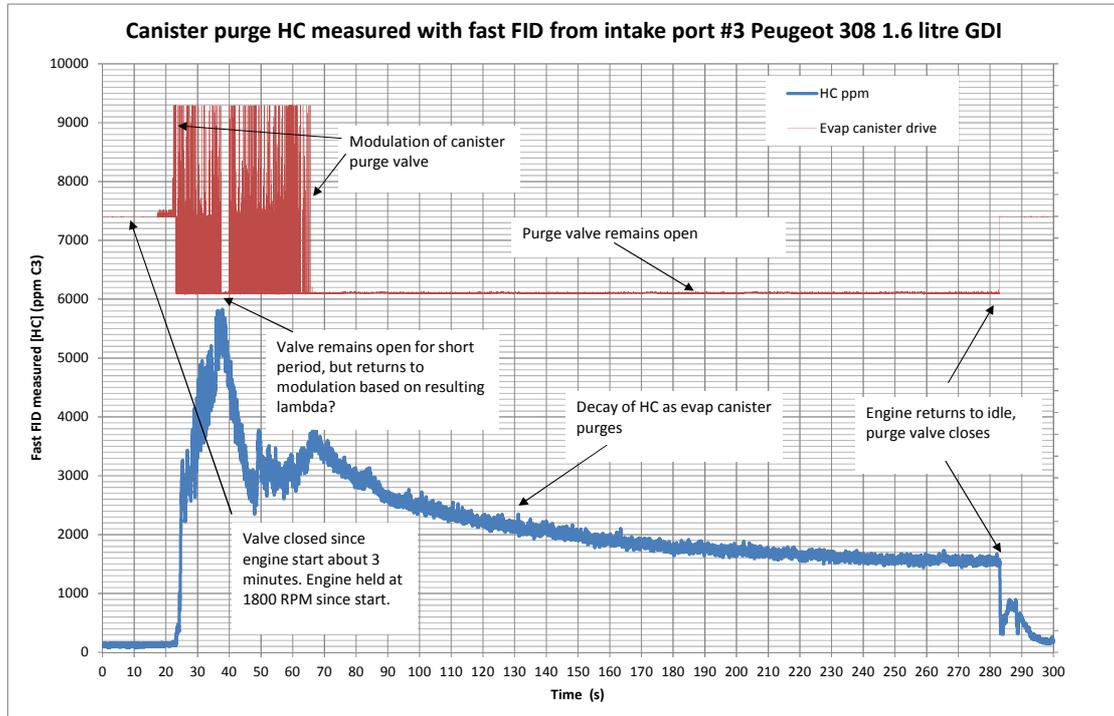
The entry point of such gas is generally downstream of the throttle which poses a problem when sampling with the fast FID: the pressure here at light load is too low for the standard fast FID pressure set points to extract gas.



A solution is to use a small volume pump to extract just enough sample gas from the intake manifold to satisfy the flow requirements of the fast FID and then use the fast FID to sample from the pump’s exhaust. By sourcing a pump which runs hot enough to avoid any significant liquid HC hang-up, but with small enough trapped volume to avoid slowing down the resulting response time too much, a system has been designed which yields a T10-90% response time of less than 100 milliseconds.

The photo shows the HFR500 fast FID sampling from such a pump’s exhaust. The pump is drawing its sample from a position close to the intake port of the cylinder head, cylinder number 3 on this Euro IV, 1.6 litre turbocharged GDI engine.

The engine was started and held at 1,800 RPM under a steady light load until the evap canister purge started. The resulting data is shown below where the modulation of the canister's purge flow solenoid valve is plotted against the measured HC in the intake gas stream.



For more information about how to perform such tests, please contact [support@cambustion.com](mailto:support@cambustion.com)