POLARIS™ Laboratories

# Fuel Dilution Testing Changes

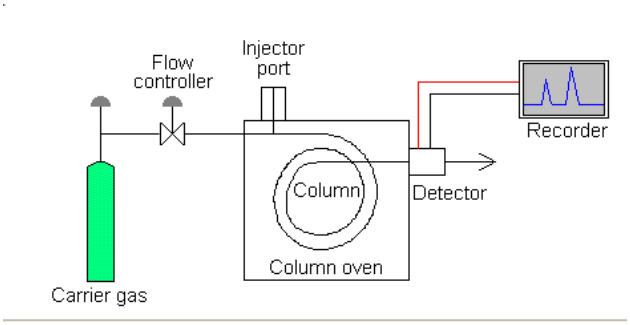
TECHNICAL BULLETIN



Recent changes in oil and fuel formulations – the new CJ-4 oils, the ULSDF requirements and the growing popularity of biodiesel – as well as modifications in engine design – EGR and DPF technologies – have instigated changes in fuel dilution testing methodology, specifically gas chromatography (GC).

Engine oil becomes contaminated with diesel fuel when "blow-by" – raw, unburned or incompletely burned fuel that gets past the rings – ends up in the crankcase. This "fuel dilution" reduces viscosity, which means reduced lubricity and eventually increased engine wear.

Testing for fuel dilution has always been a challenge. The fact that you are measuring the amount of one petroleum product within another limits the accuracy of some of the traditional methods for determining fuel dilution percent as they don't differentiate well between the two. Gas chromatography is a method for separating the components of a mixture and measuring the amounts of each. Components are separated from one another by vaporizing the sample into a carrier gas stream that is passed through a column containing a substance that selectively adsorbs then releases the components to be measured.




GC by the traditional ASTM D3524 and D3525 methodology has proven to be a time-consuming process and highly stressful on the instrumentation. FTIR has been considered a viable alternative but often requires confirmation by additional testing for flash point. An improved GC method has recently been introduced by PerkinElmer Life and Analytical Sciences that is much better at differentiating between components after separation, which significantly improves the accuracy of GC results.

Calibrating the instrumentation for diesel fuel, biodiesel fuel and gasoline, POLARIS' research and testing of this new GC method over the past six months has found its repeatability, reproducibility and degree of uncertainty to be well within the requirements of our ISO 17025 A2LA Quality System. As a result, we are no longer using FTIR to screen engine samples for fuel dilution. We now confirm fuel dilution by GC based on a variance in the oil's viscosity.

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Because a #2 diesel fuel typically has a viscosity of around 1.7-2.1 cSt at 40°C, which is thinner than a typical 15W40 engine oil with a viscosity of around 14.7 cSt at 100°C, fuel dilution reduces the engine oil's viscosity. When the oil's viscosity varies by more than one (1) cSt from the **known** starting viscosity of the oil when new, we will confirm fuel dilution by the new GC method reporting the result as we do currently – as percent by volume. However, if lubricant grade **is not** included with the sample, fuel dilution will be confirmed by GC if viscosity is below 13.3 cSt for a diesel engine oil and below 9.8 cSt for a gasoline engine oil. If viscosity is above the oil's mid-point for the grade, fuel dilution will be reported as <1.0 %.

Customers that prefer **all** engine samples be run on GC for fuel dilution must contact Customer Service at 877-808-3750 and request that this change be made to their account. A small charge will be added to the existing engine sample price.

POLARIS Laboratories' ISO 17025 A2LA accreditation requires continual improvement of the methodologies and technologies used in the testing programs we offer. This change in fuel dilution testing methodology is a result of our commitment to that continuous improvement process.