On-site measurements can help avoid inaccurate fuel blends

Removing uncertainty

A number of economic situations such as increased crude oil prices, political unrest in oil producing countries, government subsidies, and technological improvements in ethanol production, have led to increased use of ethanol in automotive fuel.

Ethanol is also added to automotive fuel as an oxygenate, octane enhancer and a fuel extender or petrol substitute. It is the most widely used renewable fuel. This increase in ethanol usage has created some challenges, however, especially for fuel blenders. Without the ability to quickly and easily test blend ratios at the rack, incorrect blends can ultimately cause mechanical engine problems.

Ethanol blends up to 10% are common in the US, while some countries have been successfully using higher percentages. A major concern is that higher blend-ratios may cause engine problems in vehicles not designed for such blends.

In older vehicles, already brittle plastic and rubber components could disintegrate when exposed to ethanol causing leaks and blocking filters and fuel systems. Sediment accumulations could also be washed clean by the ethanol and again cause fuel blockages.

Small two-cycle engines such as those used in lawnmowers and outboard boat engines tend to be more effected by ethanol in fuel. The ethanol can dissipate the oil in the gas/oil mix keeping it from lubricating the engine. It also attracts water, and in occasional-use engines, this can cause rusting of metal parts leading to clogged valves. Higher ethanol blends can result in increased idle speeds, possibly causing a clutch to engage on its own.

Picture caption to come

Since ethanol is used as an oxygenate, a lower blend can mean that the fuel does not meet the stated octane level. If the octane is too low, the gas ignites by compression rather than from a spark from the spark plug. This can cause potentially damaging knocking in the engine. Low octane will also reduce the horsepower in higher performance engines. While the main damage in this case might only mean losing a stop light drag race, it could also cause acceleration problems on the onramp in the race to merge onto a busy highway.

Whether actual or perceived, the costs of mixing a different level of ethanol than what is labelled at the pump will most likely land on the blender. While blending systems at fuel terminal loading racks are considered quite reliable, they are never foolproof and neither are the operators which make the adjustments. It is not unusual that too much or too little ethanol may be loaded into the tank truck without being detected at the rack, and ultimately make its way to the consumer. Having the capability to quickly check the blend at the loading rack ensures correct deliveries and avoids delays caused by waiting for results of samples sent to a centralised laboratory for measurement.

Several other factors are known to contribute to blending errors. Multiple bay fuel loading racks can experience variations in the flow rates of the ethanol and petrol due to sudden pressure changes as one of the tank trucks begins or completes filling. If the blending equipment is not properly set up to compensate for these flow rate changes by maintaining a set pressure in the main header, the resulting blend ratio can be different than expected.

Even if the blending equipment is adjusted and working properly, other factors can affect the final blend percentage. One of the most notable is the variation in the denaturant level of the ethanol. The denaturant is usually natural petrol and is typically blended at 5%. If this percentage differs from the expected level, the contribution of the denaturant to the ethanol blend ratio will not be correctly compensated.

Another cause of uncertainty in the final blend level is due to the fact that when ethanol and petrol are blended, the total volume will expand. For example, a mix of one hundred gallons of ethanol added to 900 gallons of petrol will add up to more than 1000 gallons of blended fuel. Consequently, without some way to actually test the fuel blend at the rack, simple proportional blending could lead to an incorrect blend calculation.

Infrared analysers offer a simple, accurate and low cost solution to on-site testing. If any of the situations described above occur at the blending rack, the resulting costs of an incorrect blend can far out way the modest cost of an on-site ethanol blend analyser.

An infrared analyser can be set up with a filter mounted on a detector that is specific to ethanol analysis. The advantages of a filter based infrared analyser include: convenient size, lower cost, ruggedness, decreased power usage and ease-of-use. A portable analyser employed at or near the terminal rack to double check blend levels before problematic fuel leaves the terminal could catch a potentially costly error and help eliminate the uncertainty of inaccurate blends. ●

For more information:
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