

Controlling refinery processes to enhance profitability

The fast process analyzer PGC5009



Accurate and faster measurements enable the tight control needed to optimize and maintain profits.

Measurement made easy

PGC5009 fast gas chromatograph

Industries

Chemical | Petrochemical | Refining

Introduction

Increasing the profitability of industrial processes is strongly driven by minimizing quality compromise, avoiding off-specification product and reprocessing. When multiple products are manufactured, the ability to increase production of the high margin products, while reducing production of lower margin products significantly enhances the bottom line. These scenarios are always present in oil refineries. Accurate and faster measurements enable the tight control needed to optimize and maintain profits. The performance and reliability of the fast simulated distillation Process Gas Chromatograph (PGC) has several desirable features making it ideal for a variety of process control applications.

Benefits

The PGC5009 simulated distillation analyzer can change the way blending is accomplished in the production of gasoline and diesel. Using a faster analysis technique allows the refiner to blend to a pipeline, eliminating storage costs, as well as maximizing the blending revenues by tighter control

of the process. This fast analysis time can also alert refineries if equipment is not functioning to specifications based on the quality of the products produced. Properties such as vapor lock index and drivability index both require boiling point information to control processes. Figure 1 is an example of feeds used in gasoline blending. The boiling points of these components in the distillate is crucial for refineries. Refineries producing diesel fuel are always looking for ways to improve the yield rate of high-value components, such as, ultra-low sulfur diesel (ULSD). The refinery is also continuously looking for ways to cut operating costs by increasing the life of the catalysts, and gain from additional catalyst runtime. By proper management of the feed cut point, DBTs (Dibenzothiophenes) can be excluded, which will allow for optimization of throughput, with operation at a lower unit severity. Operation at lower severity also extends catalyst life. Fast GC with simulated distillation and temperature programming capability impacts these refinery objectives by accurately and consistently monitoring the production quality of ULSD feed. The fast analysis can potentially save a refinery millions of dollars every year, by optimizing production results.

Fast and accurate results

ASTM D3710 for gasoline fractions up to 260 °C

The ideal transmitter for industrial applications and harsh conditions

Analyzer

This fast TPGC design implements a simple hardware configuration consisting of three basic elements; a liquid sample vaporization (LSV) valve, a heated column module and a flame ionization detector (FID) as shown in Figure 2. The column is contained within a column housing. It is designed for rapid thermal response, able to reach programmed temperatures ranging up to 280 to 320 °C (536 to 608 °F), depending on the applications. The micro-packed metal column has an electrical connection on each end. When a low voltage, direct current (DC) is applied, the column becomes a heating element, as shown in Figure 3. The column has a low thermal mass, so it will heat and cool extremely fast.

Fast Results

ASTM D3710 is used for C3 to C15 hydrocarbon gasoline fractions with temperatures up

to 260 °C (500 °F). The standard has specific requirements for the 19 components' concentration. The chromatogram shown in Figure 4 is a calibration standard overlaid with a gasoline sample. The sample is within the initial boiling points of the calibration, which we required for accurate results. The highest boiling point component C15 elutes within 140 seconds, leaving the remainder of cycle time for column cooling and boiling point calculations.

ASTM D2887 is used for diesel fractions having boiling points from 55 to 538 °C (131 to 1000 °F). The chromatograph shown in Figure 5 is a calibration standard overlaid with a diesel sample. The calibration ranges from C5 to C32, eluting within 125 seconds. These examples are only the first of many application possibilities for the PGC5009, which takes advantage of its extraordinary application speed.

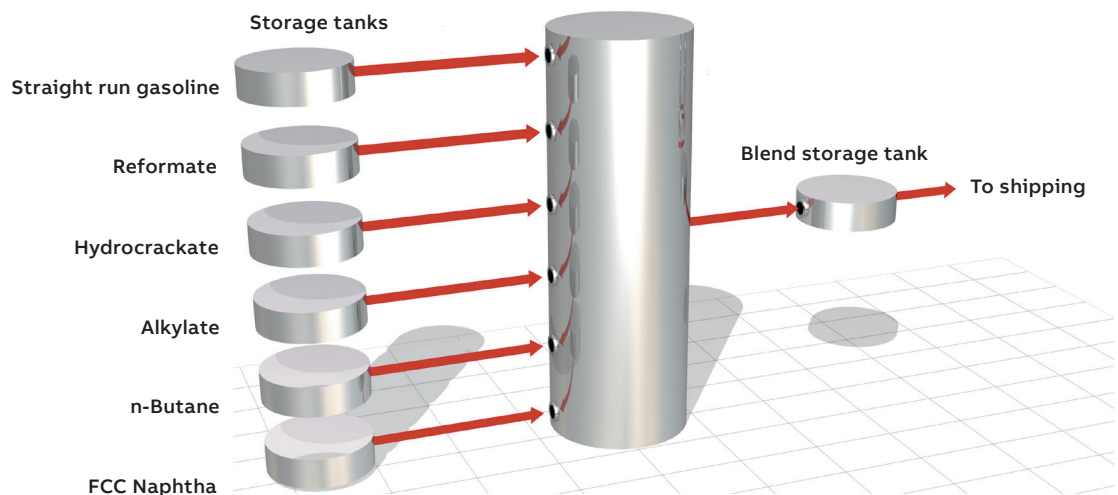


Figure 1 Example of gasoline blending

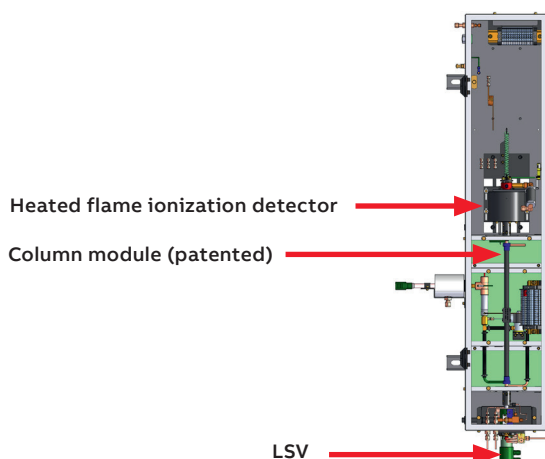


Figure 2 TPGC hardware configuration

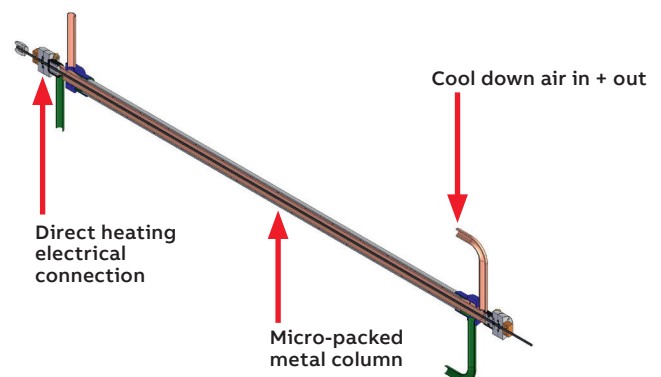


Figure 3 TPGC column module

Conclusion

Tight control of blending operations by the fast simulated distillation TPGC is possible based on the speed at which an analysis is conducted. This speed is possible without sacrificing measurement capabilities or accuracy.

As a result of this analytical speed, these process analyzers become integral to improved process control strategies and distillate blending operations, which could result in refineries savings millions every year.

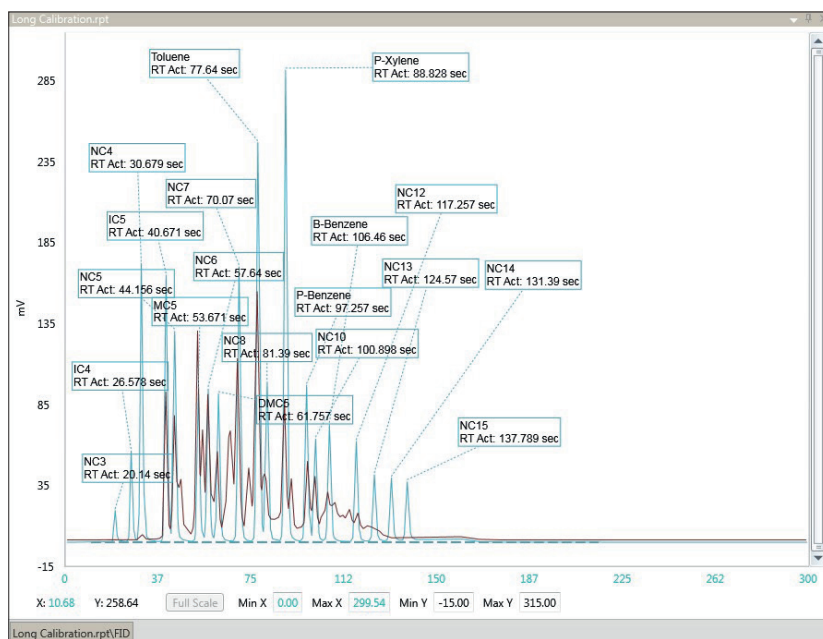


Figure 4 Gasoline calibration and sample overlay

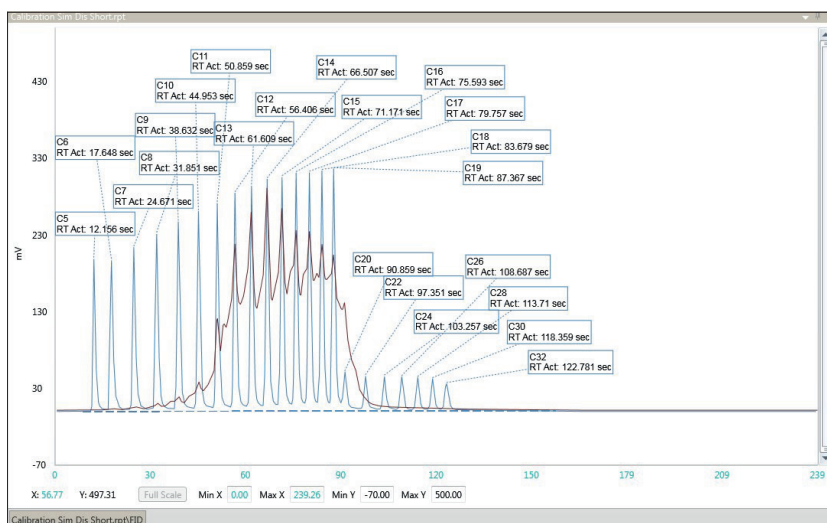


Figure 5 Diesel calibration and sample overlay

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