

On line mercaptans analyzer in kerosene

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Introduction

Secauto is a company member of Clemessy, itself member of Eiffage. French leader in industrial analysis, this company has developed an on line mercaptans analyzer in kerosene. The SECAN-RSH (SECauto Analyzer) allows the determination of the amount of sulfur in hydrocarbon. Those on line analyses allow the regulation and the adjustment of the KEROX unit parameters in real time. This analyzer can also be used to anticipate the regulation of the unit in case of charge changing.

Material and methods

The kerosene flows through different pipes to get into the measuring cell. The flow is guided by several valves controlled by the PLC (programmable logic controller). A calibrated loop enables the introduction of the expected volume of hydrocarbon in the measuring cell. The analytical unit is composed by the measuring cell, a pneumatic agitator and 3 electrodes (silver, platinum and combined electrodes).

The quantitative determination of mercaptans is based on their precipitation with silver ions. The generation of Ag⁺ ions is managed with a coulometric method by oxidation of a silver electrode. The evolution of the reaction is followed by a potentiometric method. A PID (Proportional Integral Derivate) controls the generation of current in order to be :

- Fast at the beginning,
- Controlled at the equivalence
- Nil after the equivalence.

At the equivalent point the number of silver ions is equal to the number of moles of mercaptans. Knowing the density (d) and the volume of the sample, the amount of mercaptans is calculated with the following relation:

$$\text{RSH amount (ppm)} = \frac{Q \times M_{\text{sulfur}}}{F \times v \times d}$$

Q = i × t (i: current in amperes, t: time in seconds)
F: number of Faraday (96500 Coulomb)

Results and discussion

During the analysis, the automate draws curves corresponding to the evolution of the measurement. Figure 1 illustrates the evolution of the measures of the combined electrode and the setpoint (corresponding to the equivalent point) during different analyses. We can notice that analyses are stopped when the measure reaches the setpoint. Figure.3 is a graphic showing the repeatability of the analyzer and laboratory analyses. As we can see in this figure the analyzer gives a correct and repeatable value of RSH amount compared with the lab value.

Conclusion

Thanks to this analyzer, laboratory systematic analyses are not necessary to ensure the correct regulation of the unit.

The SECAN-RSH makes 2-3 analyses per hour and is available 24 hours a day with an accuracy of 1ppm whereas lab analyses are only done once a day.

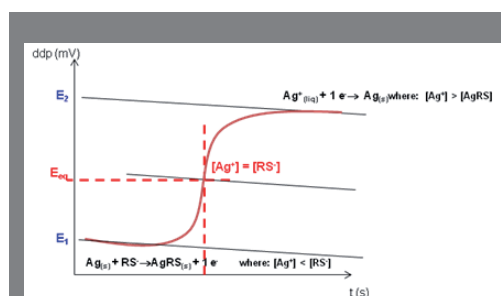


Figure.1 : dosage curves of RSH by silver ions

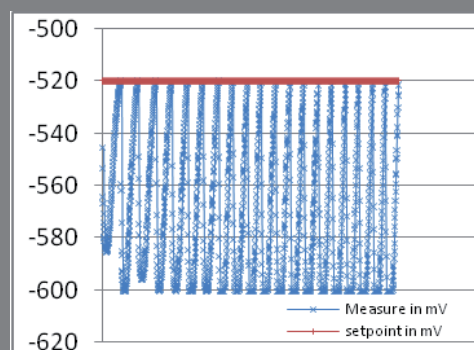


Figure.2 : evolution of the measures

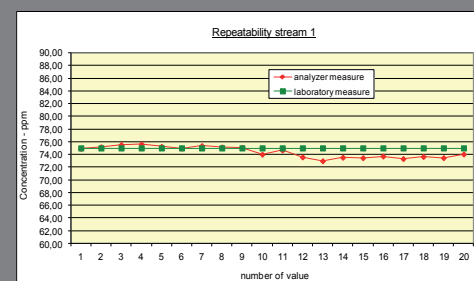


Figure.3 : repeatability tests

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