PAC | Technical Note

Septum Change Interval on ElemeNtS Combustion Analyzer Guaranteeing Optimal Performance.

- Maximum Uptime of the Instrument
- Optimal Performance of the Analyzer
- Excellent Sensitivity, Repeatability & Linearity

Keywords: ElemeNtS, **Septum replacement, Sulfur, Nitrogen.**

INTRODUCTION

Ensuring good performance of the instrument is crucial for all users making it import to do preventive maintenance and regularly replace consumables to minimize downtime. One of the consumables that needs regular replacement is the inlet septum. Depending on the amount of injections the septum needs to be replaced more frequently. In this technical note we investigated the effect of a leaking septum on the actual results.

RESULTS

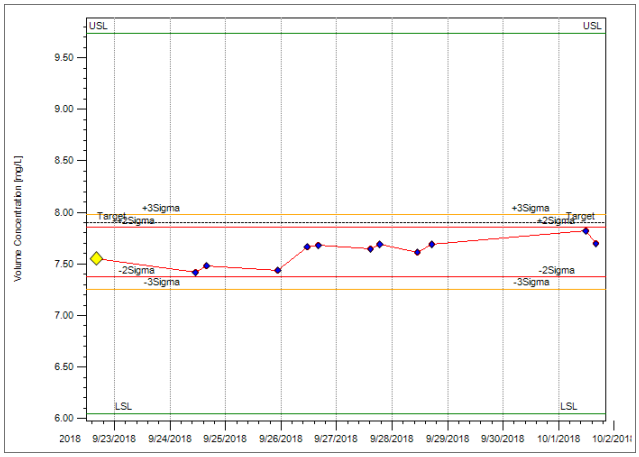
Over a period of one week a B7 diesel sample has been analyzed without changing the septum. The number of injections done on the instrument are monitored and the results are plotted in a QC chart. Every result is an average of five replicate analysis. RSD values in Table 1 show excellent repeatability during the complete test. In total more than 1100 injections were executed in this test without changing the septum.

Table 1: Results Diesel B7 sample with registered amount of injections and vacuum and pressure test results

Completed at	# injections	S Concentration (mg/kg)	S-RSD	N Concentration (mg/kg)	N-RSD	Vacuum test	Pressure test
Day 1	0	9.807	0.4	63.007	0.4	Pass	Pass
Day 3	431	9.628	0.3	62.085	0.4	Pass	Pass
Day 3	484	9.715	0.2	62.491	0.2	Pass	Pass
Day 4	537	9.660	0.4	61.543	0.2	Fail	Pass
Day 5	655	9.953	0.3	63.308	0.3	Fail	Pass
Day 5	708	9.970	0.6	63.809	0.5	Fail	Pass
Day 6	761	9.925	0.4	63.885	0.2	Fail	Pass
Day 6	814	9.985	0.1	63.958	0.6	Fail	Pass
Day 7	867	9.883	0.3	62.675	0.4	Fail	Pass
Day 7	920	9.985	0.3	62.327	0.5	Fail	Pass
Day 10	1040	10.151	0.3	62.099	1.0	Fail	Pass
Day 10	1146	9.994	0.4	61.815	0.9	Fail	Pass

STABILITY

Below charts display the results for both sulfur and nitrogen presented in Table 1 with corresponding upper and lower limit statements from PTP results. Relative standard deviation determined on the complete set of data is less than 2% for both sulfur and nitrogen showing very good stability while the vacuum test already indicated a leak in the instrument.



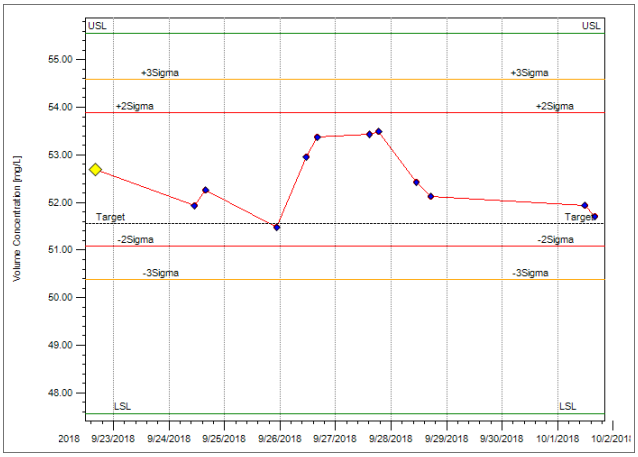


Fig 1: ElemeNtS Software integrated QC chart showing stability for 1100 analysis

CONCLUSION

Presented results show excellent stability of the instrument during all 1100 injections executed in this test. Results show no bias effect due to a leaking septum and standard deviations remain stable over time. After about 500 injections the vacuum test is failing while the pressure test still passes. The reason for it is that during the vacuum test the septum is pulled in and the gap created by the needle opens up a bit while during the pressure test the septum is pushed outward and the silicon closes the existing hole. During injection the inserted needle closes the hole in the septum preventing sample loss hence the stable results displayed in Table 1.

During operation the pressure in the inlet is above ambient (~10 kPa) therefore a pressure test is more indicative to test whether your septum is leaking. A vacuum test is still an excellent tool to determine leak tightness of the instrument prior to injecting through the septum.

Though results look good for samples with higher concentrations we do see an increase in RSD for samples in low and trace range when more than 500 injections are done. For that reason it is advised to replace the septum every 250-500 injections to ensure good performance of the instrument.

Antek's lab instruments provide reliable, precise elemental analysis for total nitrogen and sulfur, speciated nitrogen and sulfur, fluoride, chloride, and bromide. Antek products are recognized by global regulating bodies, leading scientific research institutions, and process laboratories as the instrument of choice for selective multi-element detection.