Warm Up Before You Run

Why conditioning your inlet parts after maintenance is good practice

By Scott Grossman, GC Accessories Chemist

- Eliminate background peaks and avoid costly reanalysis.
- Improve reproducibility and system performance.
- Demonstrate system cleanliness.

Every good coach tells athletes to warmup before they run to make sure the body is primed for optimum performance. The same principle applies to maintaining your gas chromatograph—time spent warming up the analytical system after maintenance pays big dividends by improving accuracy and reducing the need for reanalysis. No matter whose products you purchase, inlet parts, just like columns, require a brief conditioning before they are ready for analytical work. Although it is tempting to save time by jumping directly into sample analysis after maintenance, warming up your system helps you ensure accurate results the first time. In this article, we will highlight inlet liners as a perfect example of the need to condition your inlet after maintenance to avoid costly coelutions, irreproducible results, and avoidable reanalysis.

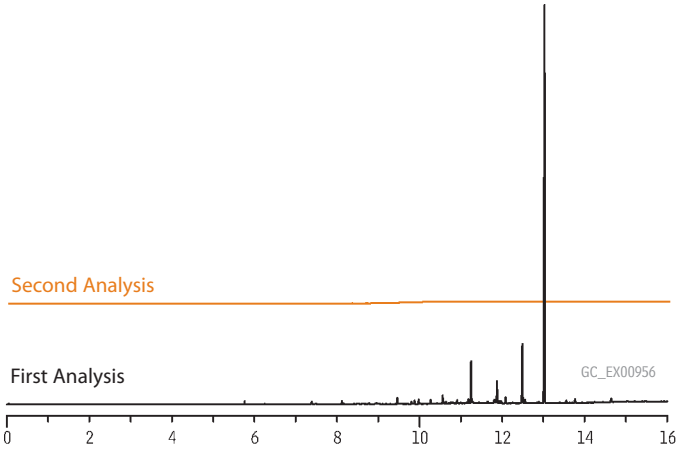
Sources of Contamination

Even the best liner can exhibit a small bleed pattern if it is used immediately after installation. Common sources of contaminants that can cause bleed include plastic packaging (e.g. phthalates used to make plastics more flexible) and fatty acids from finger oils. To evaluate bleed from contaminated liners, we first established a clean baseline with a control liner, then installed a test liner, and ran the instrument without making an injection. Figure 1 illustrates the effect of handling an inlet liner with bare hands. Even some gloves will impart hydrocarbon contamination that can be very prominent and persistent (Figure 2). So, care needs to be taken when handling your new liners. Handling liners with clean forceps or lint-free technical wipes is a good way to prevent liner contamination.

Reduce Noise by Conditioning Your System

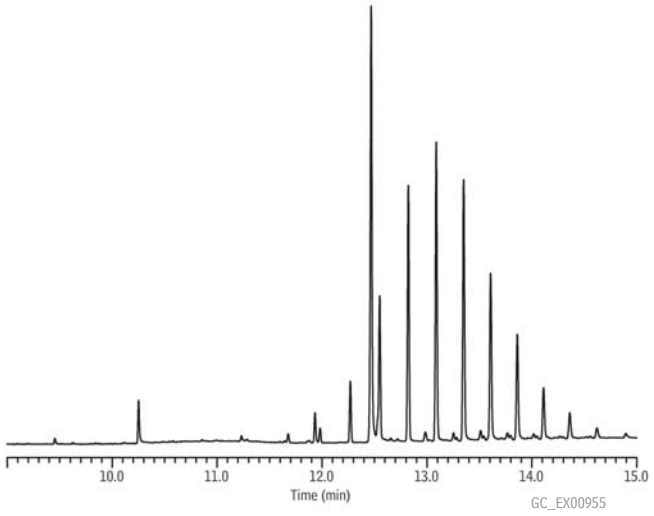
This contamination, also called background "noise," can be eliminated simply by conditioning the GC system prior to use. You can condition the entire inlet a variety of ways. One suggestion is to make a few preliminary runs using the analytical method parameters (inlet temperature, oven program, etc.) to be used in the subsequent analyses. We evaluated several commercially available liners and determined that liner bleed generally will be gone by the second or third run (Figure 3). An

Figure 1 Eliminate contamination peaks from finger oils by warming up the system prior to sample analysis.



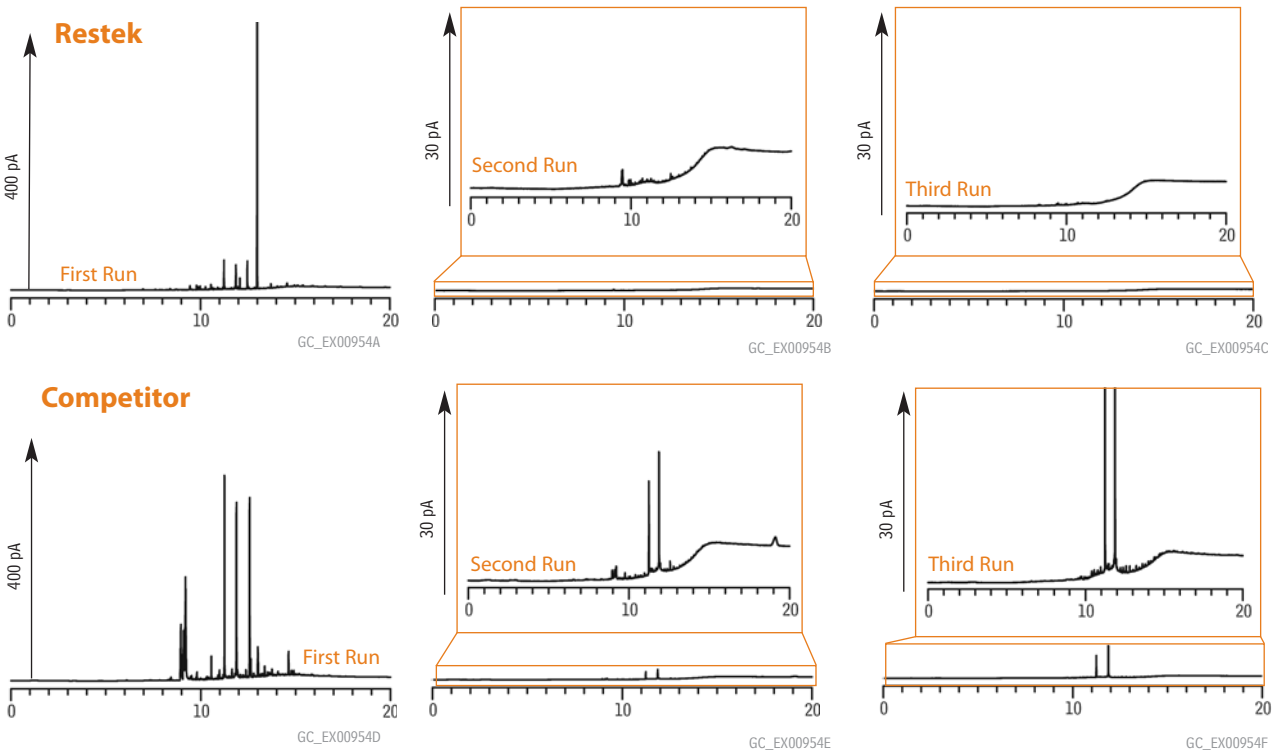
Column:	Rxi®-5ms, 30m, 0.32mm, 0.25µm (cat.# 13424)
Sample:	no sample injected; instrument ran the method conditions with no injection.
Inj.:	no injection; splitless mode (hold 0.5 min., split flow 40mL/min.) 4mm split with wool inlet liner, IP deactivated (cat.# 20782).
Inj. temp.:	250°C
Carrier gas:	helium, constant flow
Flow rate:	5.0mL/min.
Oven temp.:	50°C (hold 5 min.) to 320°C @ 30°C/min. (hold 10 min.)
Det.:	FID @ 330°C

Figure 2 Hydrocarbon peaks from nitrile gloves are another example of contamination from maintenance activities that can be eliminated by warming up the system.



Column:	Rxi®-5ms, 30m, 0.32mm, 0.25µm (cat.# 13424)
Sample:	no sample injected; instrument ran the method conditions with no injection.
Inj.:	no injection; splitless mode (hold 0.5 min., split flow 40mL/min.) 4mm single gooseneck liner with wool, IP deactivated (cat.# 22406).
Inj. temp.:	250°C
Carrier gas:	helium, constant flow
Flow rate:	5.0mL/min.
Oven temp.:	50°C (hold 5 min.) to 320°C @ 30°C/min. (hold 10 min.)
Det.:	FID @ 330°C

Figure 3 Warmup your system and invest in quality liners to reduce noise and improve accuracy.



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Inj.:	no injection; splitless mode (hold 0.5 min., split flow 40mL/min.) 4mm split with wool inlet liner, IP deactivated (cat.# 20782).	Flow rate:	5.0mL/min.
		Oven temp.:	50°C (hold 5 min.) to 320°C @ 30°C/min. (hold 10 min.)
		Det.:	FID @ 330°C

advantage to this technique is that it doesn't exert any additional thermal stress on the system, which may mean longer lifetimes for some parts, such as inlet O-rings.

Another method is to elevate the thermal zones in your instrument for a set period of time. The data in Figure 4 show that a flat baseline is achieved after just ten minutes of thermal conditioning. If you use thermal conditioning, be sure to use progressively hotter temperatures along the sample flow path. For example, your column should be hotter than your inlet, and your detector should be hotter than your column. This prevents condensation of contaminants in the system which can appear as "ghost peaks" or poorly shaped peaks that elute at irreproducible retention times.

Conclusion

We observed that no matter whose product you buy, you can expect some background noise if you install an inlet liner and immediately begin analysis. However, these background peaks easily can be eliminated by either a few warm-up runs or a brief period of thermal conditioning. Before analyzing valuable samples, take the time to warm up your system, ensuring that you are ready to run!

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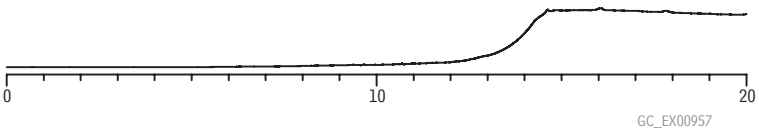
Figure 4 Conditioning your system above method temperatures is an excellent way to remove contaminants.



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