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WHITE PAPER

No. 72087

The Case for Automated Tracking of IC Consumables

Monitoring IC Consumables' Performance

Chromatography consumables affect overall system performance in a multitude of ways. Eluent generation and purification is achieved in Thermo Scientific™ Dionex™ Reagent-Free IC (RFIC™) systems using a Thermo Scientific™ Dionex™ EGC Eluent Generator Cartridge and a Thermo Scientific™ Dionex™ CR-TC Continuously Generated Trap Column. Separation is achieved with a guard and separator column set. Detection is enhanced with an eluent suppressor and carbonate removal device. Yet, the performance of each of these important components is often overlooked until something goes wrong. It seems obvious that monitoring consumables' performance should be a high priority, yet this task is often overlooked by many ion chromatograph operators.

The inability to track consumables on a daily basis can complicate numerous processes for labs such as:

- Keeping logbooks up to date.
- Maintaining accurate preventative maintenance schedules.
- Tracking performance metrics.
- Failure analysis during troubleshooting.
- Switching between different consumables sets for different analyses, such as anion and cation applications.

Let us discuss in detail three situations where lack of a procedure for monitoring consumables' performance creates a negative impact in the laboratory.

Case 1

Consider a typical drinking water test laboratory that performs compliance testing for drinking water using U.S. EPA Method 300.1. The lab receives requests for both anion and cation analyses, with the majority of the samples requiring anion analysis. The analysts use a single IC system that is routinely converted from anion to cation analysis. This conversion occurs about every two weeks, when the cation analyses are performed over a day or two.

The lab's anion method uses a manually prepared carbonate eluent, while their cation method uses a manually prepared methanesulfonic acid eluent. After switching their system from anions to cations or vice-versa, it usually takes at least a few hours to flush out the system before analysis can resume. If possible, this switchover is run overnight to ensure a stable baseline is achieved the next day.

On occasion, the switchover between cation and anion analyses causes issues. In the past, the wrong suppressor or one of the columns has been left in place after the system was converted. This results in poor peak shapes that compromise results, or in system contamination that makes analysis impossible without corrective action. It typically takes a few hours to notice the mistake and another few hours to correct it and flush the system out again.

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Case 2

This case involves a lab manager who manages multiple IC systems for monitoring power plant steam water. The lab manager also manages multiple analytical chemists who operate these IC systems. The IC systems are used primarily for trace anion analysis of steam water. The lab cannot afford systems to be down for more than a few hours, otherwise it will affect downstream processes. The standard operating procedure (SOP) they follow requires that consumables are tracked and replaced on a regular basis as part of routine preventative maintenance. The lab manager is focused on maximizing instrument uptime, but is also concerned about the cost of replacing consumables. Too many unscheduled replacements can overrun the lab's operating budget.

The lab's SOP requires physical logbook entries be kept up to date. However, with multiple operators, updating logbooks is not always consistent. In certain cases, consumables may be switched out before scheduled in order to address performance issues. If these unscheduled changes go unlogged, there is a discrepancy between the logbook and the actual configuration.

When an auditor identifies the discrepancy, the audit automatically fails. Consequently the system has to be taken offline to address the discrepancy resulting in unnecessary downtime.

Case 3

Finally, consider a beverage testing laboratory that performs quality control (QC) analysis on fruit juices and carbonated beverages. The lab runs one IC system for organic acid analysis and is very focused on maintaining a low cost of operation per sample, while meeting management requirements for fast turnaround and accurate results.

Over the years, the lab technician has learned that certain changes in the baseline and peak shape usually correspond to an impending consumable failure. An increase in baseline, for instance, usually indicates an impending failure of the suppressor or Dionex CR-TC Continuously Regenerated Trap Column. It may also indicate that the deionized water system needs maintenance. On several occasions, the suppressor has been replaced only to find that it was a different consumable or that the water system was responsible for the raised baseline. Additionally, at times the technician has suspected that the background conductivity was abnormally high, but could not remember how long the system had been like that.

What is the Consumables Device Monitor?

In these cases, labs were either not monitoring consumables' performance at all or they were using a manual process to do so. These labs would benefit from an automated process from start to end. Recently, Thermo Fisher Scientific introduced a feature called the Consumables Device Monitor.

In a system employing the Consumables Device Monitor, such as the Thermo Scientific™ Dionex™ Integrion™ HPIC™ system or the Thermo Scientific™ Dionex™ ICS-6000 HPIC™ system, a memory chip is embedded on each consumable. With this memory chip, data is stored directly on the consumable itself to ensure data is transferred with the consumable item. This feature ensures traceability of the data and takes the guesswork out of consumables monitoring.

Specifications for the consumable are stored on the memory chip during factory preprogramming. After installation on the system, usage and performance metrics are written to the chip while in operation. Additionally, at the time of installation, the system will alert the operator if detected consumables are mismatched.

Let's continue to discuss the three aforementioned cases to better understand how the Consumables Device Monitor improves laboratory performance.

Case 1

With the Consumables Device Monitor in place, the drinking water test laboratory would not have to worry about mismatching consumables. After switching the system to cation analysis for a day, the system was converted back to anion mode. After completing the conversion, the system detected that a cation suppressor had been paired with an anion column set. The system operator was able to remove the cation suppressor and replace it with the anion suppressor, before turning on the pump and potentially contaminating the consumables.

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Savings: 8 hours downtime

Case 2

With the Consumables Device Monitor, the power plant lab manager does not need to use physical logbook entries. The IC system automatically logs the installation date on each consumable without human intervention. Logging mistakes due to human error are eliminated and preventative maintenance is scheduled accurately.

Additionally, the lab can track the performance metrics of each consumable; something their manual logbook was never able to do. This gives them a greater level of confidence in the performance of each consumable. The lab manager can consider extending the preventative maintenance schedule for some of the consumables in order to reduce operating costs. Relying on performance metrics, decisions on unscheduled consumables replacements can also be assessed with greater accuracy.

Savings: Time spent updating physical logbook entries, doing paperwork for preventative maintenance or audits, and excessive consumables replacements

Case 3

With the Consumables Device Monitor, the beverage testing laboratory had the tools necessary to accurately troubleshoot issues in a timely manner. A few months after setting up the instrument, the technician suspected that the background conductivity was abnormally high. The technician was able to query the background trend data and determine that the background was indeed elevated. The suppressor voltage changed at the same time that the background changed, but the CR-TC current was unchanged. The technician ordered a replacement suppressor. Upon arrival, the replacement suppressor restored the system to full working condition within just a few hours, thus eliminating unnecessary system downtime.

Savings: 2 days downtime and an unnecessary CR-TC purchase

Find out more at **thermofisher.com/IC**

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