Using ChemStation Plus and Agilent column ID tags for easier handling and compliance in regulated laboratories

Application Note

Introduction

All laboratories have some sort of repository such as a drawer or cupboard, which are full of columns. These columns are usually stored with little or no documentation about the state of the column, for example, if the column is still good, or how much it has been used?

Determining whether a column can perform suitably involves lengthy equilibration, and a series of system suitability tests. If the column fails, the same tests must be repeated on the next column and so on.

To address this problem, many laboratories attempt to keep a logbook to track column usage. Each time a column is used, the analyst or technician records the serial number, the number of samples run and the mobile phase used before returning the column to storage.

This system is time consuming and relies on each person in the lab taking the time to record the information. Further, they must also remember to update the data system with length, diameter and void volume of the column to enable accurate calculations of k' and theoretical plates. Laboratory staff often do these calculations on their own because they don't trust the recorded values for the void volume, which again wastes valuable time.

Agilent Technologies provides a convenient and compliant solution based on RF tags attached to the columns, antennas built into the Agilent 1100 Series column compartment, and control through Agilent ChemStation software.

Edit Column Identification Modules: Instrument 1

#	Position	Description	Batch#	Serial#	Product#	# Injections
1	Right	Zorbax C18	K368	AD6789X5	746450	377

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A Convenient Solution

The technology behind the Agilent column identification tag was adapted from the aviation industry where it was used to track the usage of aircraft parts. In this application it was important to replace worn parts before lifetime expiry and possible failure.

In Agilent's implementation of the technology, the 1100 series column compartment is able to read and write information to an electronic tag attached to a column. This information is read every time a new column is installed and a counter that monitors the number of injections is incremented after every run. Table 1 shows the data that can be written to the tag and monitored whenever the column is in use. All the data is overwritable, so a column tag can be transfered to a new column when an old column in discarded.

Item	Example	Comment
Product number	79916OD-552	
Serial number	950522	Date of manufacture
Batch number	1675	
Geometry (mm)	100 x 2.1	
Stationary phase	ODS Hypersil	
Particle size	5 µm	
Number of injections	1267	See note below*
Maximum pressure (bar)	350	
Maximum temperature	70	
Maximum pH	12	
Column void volume (ml)	2.65	

Table 1
Items of information that the 1100 Series column compartment can read and write to the column identification tag. The Agilent ChemStation allows to edit all items.
***The number of injections is updated after every run to create a column history.**

Operation

When a tagged column is inserted into the 1100 column compartment with the tag placed within range of the receiver, the information is read automatically and used in the appropriate calculations. To view this information or to update with new information when changing columns, the user simply goes to the Instrument menu and clicks on the item Columns. This opens the online column database where the information on many columns can be stored and tracked. In the upper window, the information read from the column tag is displayed, see figure 1.

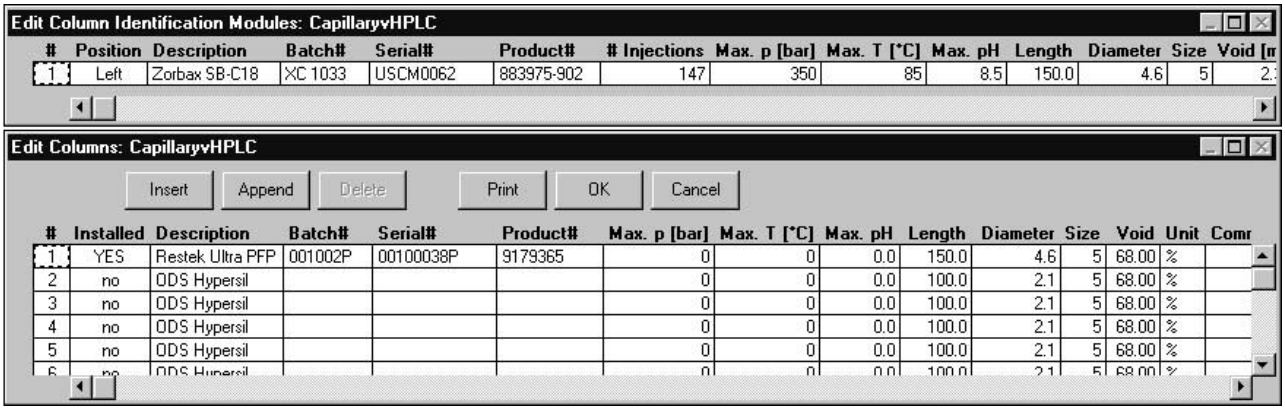

Figure 1
The online column database stores information about many columns

To update this information the user fills in the new column information and clicks OK. After confirmation, the new information is written to the column tag for future use.

Because this information is tracked by the system and automatically incremented with every injection, users can be confident that the ChemStation calculates accurately the performance parameters k' and theoretical plates. Users also know the status of any column inserted into the system without wasting any time equilibrating the column or having the column lose resolution during a crucial overnight run.

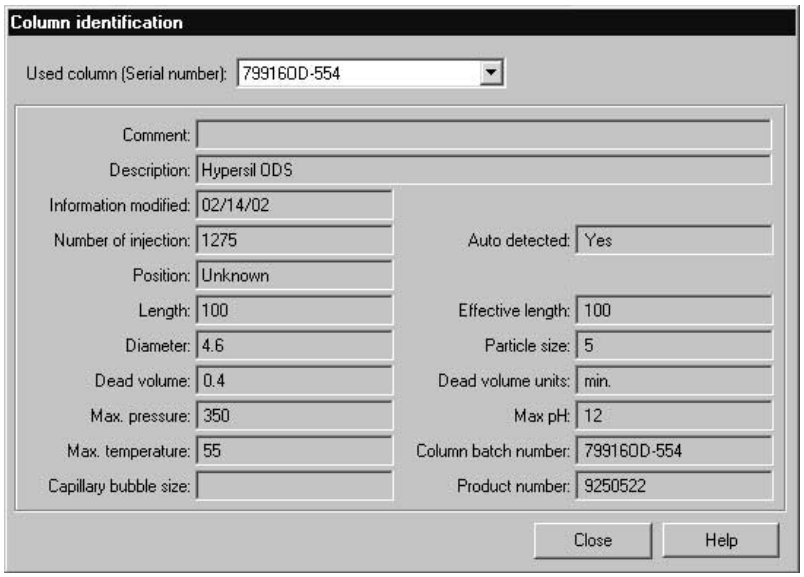

Figure 2
Column information tracked from results

Compliance

The column information is also saved automatically in the database module of the ChemStation Plus system, see figure 2.

The information is linked unbreakably to the sample results even during archiving and retrieval. This enables users to search for their samples with simple mouse clicks. When all samples matching the query are displayed, users can highlight a particular sample, click one button and see all the information that was collected during the run. This includes operator name, injection time, data, method and sequence filenames, all the column information and even the serial number of each 1100 module used to collect the data.

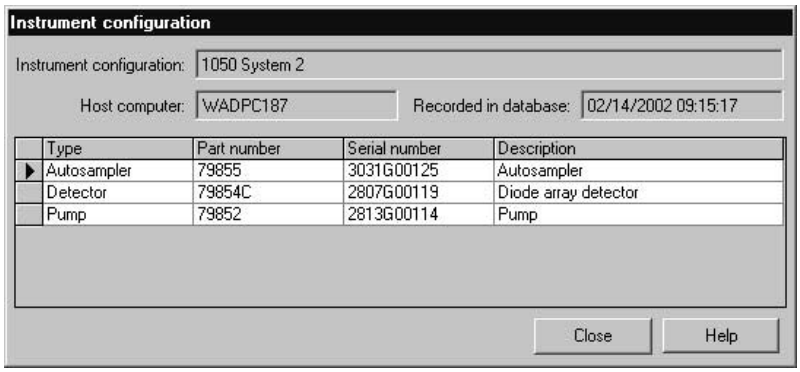

Figure 3
Instrument information tracked from results

This information could be critical in an audit situation to prove the system generating the release data was in complete compliance at run-time.

The type of control described here is called level-4 instrument control and is built into Agilent analytical instruments and the ChemStation Plus networked data system.

Laboratory Management

The column injection information also enables users to take advantage of powerful tools to track a particular LC or column's lifetime and performance. The query tools of ChemStation Plus can be used to search for all runs performed on that column and then chart the reproducibility of performance data such as retention times, resolution or even k'. This control chart in figure 4 shows the data and places the mean, warning limit (2σ) and critical limit (3σ) as lines on the chart for easy interpretation of warnings and failure.

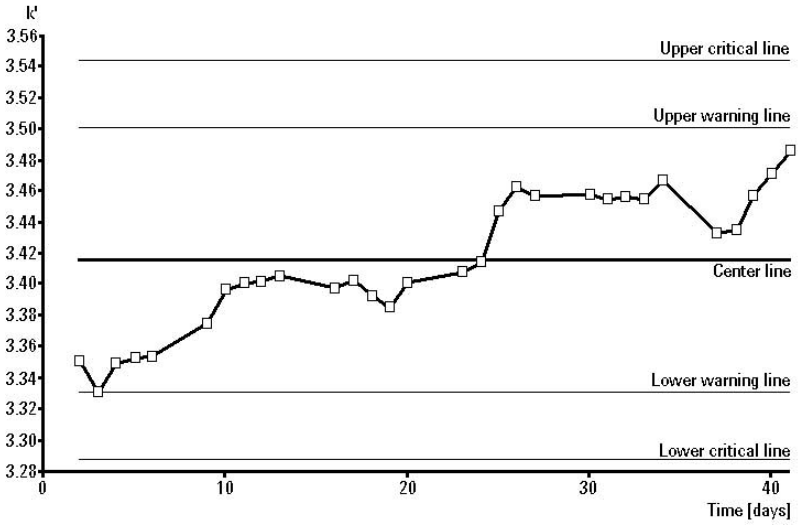

Figure 4
Using control charts to track column performance

Through regular use of this feature a method developer can monitor when columns degrade in performance and set rules as to what number of injections are the maximum allowed for a particular application. This information can also be a powerful part of determining the limits of a column application for method validation. With the charts as part of the validation report, the run information can prove that any run was within the specified validated range.

Summary

Every Agilent 1100 Series system that incules a column compartment is shipped with a column tag for evaluation. Additional tags can be ordered in packs of 3 (order number 5062-8588). These tools can help any laboratory maintain maximum productivity. Laboratories today cannot afford to waste complete runs due to overnight column degradation or waste time determining if a particular column will perform suitably for the sample runs or if it has exceeded its lifetime. By simply utilizing the available technology, laboratories can better manage their performance, increase productivity and have more control over their methods for compliance.

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