Agilent 7890B/5977A GC/MSD Integrated Intelligence Boosts Productivity and Lowers Cost of Operation

Technical Overview

Introduction

The Agilent GC/MSD system has long been a mainstay productivity tool in laboratories performing environmental, forensic toxicology, food, fine chemical, and other analyses. Each generation of the system has improved the data quality, sensitivity, ease-of-use and cost of operation, helping laboratory managers meet their performance goals during challenging economic times.

The Agilent 6890 Gas Chromatograph, which was released in 1995, was the first GC to offer a Gas Saver function to reduce the gas consumption using electronic pneumatic control (EPC). It also featured a GC Method Translator for method optimization when using new column technology. The Agilent 5973 GC/MSD, introduced in 1996, featured Early Maintenance Feedback (EMF), which assured optimal maintenance to preserve data quality.

The Integrated Intelligence of the Agilent 7890B/5977A GC/MSD system simplifies and improves the use of Gas Saver, GC Method Translator and EMF, and it adds two features to boost productivity: Sleep/Wake mode and Fast Vent. This technical overview introduces those new features and reviews the improved existing features.

Figure 1. The Agilent 7890B/5977A GC/MSD System.

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Sleep/Wake Mode

The new Sleep/Wake feature of the 7890B/5977A GC/MSD automates the setting of the system's sleep and wake parameters and reduces power and gas usage. The Sleep/Wake method is initiated from the MSD software or the GC panel (Figures 2 and 3). During routine use, the sleep and wake times can be set in the Scheduler (Figure 4). Additionally, the sleep-mode can be initiated directly from the sequence table (Figure 5). This is accomplished by simply adding the keyword at the end of the sequence. The system will then enter Sleep mode at the completion of the sequence, thus saving on power and gas consumption.

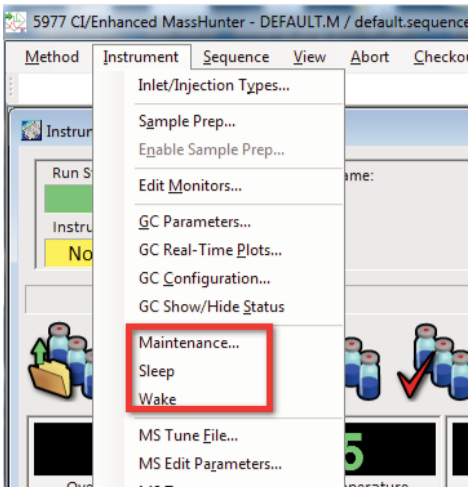

Figure 2. Accessing the Sleep/Wake feature from the instrument menu.

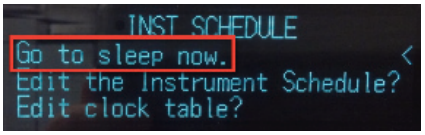

Figure 3. The Sleep/Wake schedule screen on the Agilent 7890B GC panel.

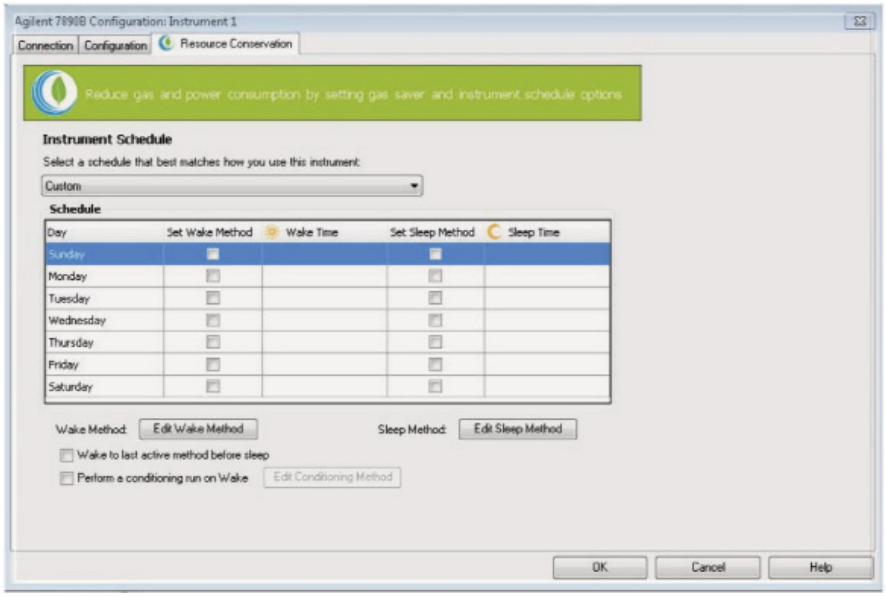

Figure 4. Setting the Sleep/Wake parameters in the Instrument Schedule screen.

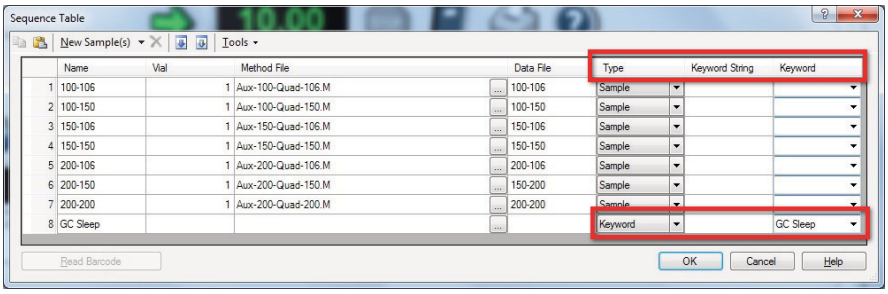

Figure 5. Using the Sleep keyword in the Sequence Table of MassHunter Software.

Fast Vent

The 5977A GC/MSD is the only system that heats the quadrupole to temperatures above 100°C (typically to 150–200 °C) to rapidly eliminate any contamination in the analyzer. This high temperature design assures rapid startup, by eliminating background noise from moisture, and assures robust and reliable results over many injections by eliminating contamination by high boiling compounds.

The heated source and quadrupole must be cooled before maintenance can begin in order to prevent oxidization of the ion source, and this can add as much as 30 to 40 minutes to the time required to perform maintenance. The new Fast Vent feature reduces the time for cooling the MSD up to 40% by directly communicating with the GC to enter MSD Vent mode.

Early Maintenance Feedback (EMF)

Regular maintenance is a key factor for optimal GC/MS results. While EMF has been part of the Agilent GC/MSD system for many years, it has now been completely redesigned and is fully integrated into the 7890B/5977A GC/MSD system. Using the EMF screen (Figure 6), an operator can quickly manage limits and service due dates. This screen also displays important parameters such as the number of injections since the last maintenance and the elapsed time since the last source cleaning. The status of GC and MSD consumables, including the inlet liner, filaments, and the pump oil, is also tracked in EMF. Additional user-defined counters can be configured as well. Deviations from the set parameters will create an alert and comment in the EMF log file, providing a history of the instrument status. The newly integrated EMF is an excellent tool to prevent major maintenance issues and reduce downtime.

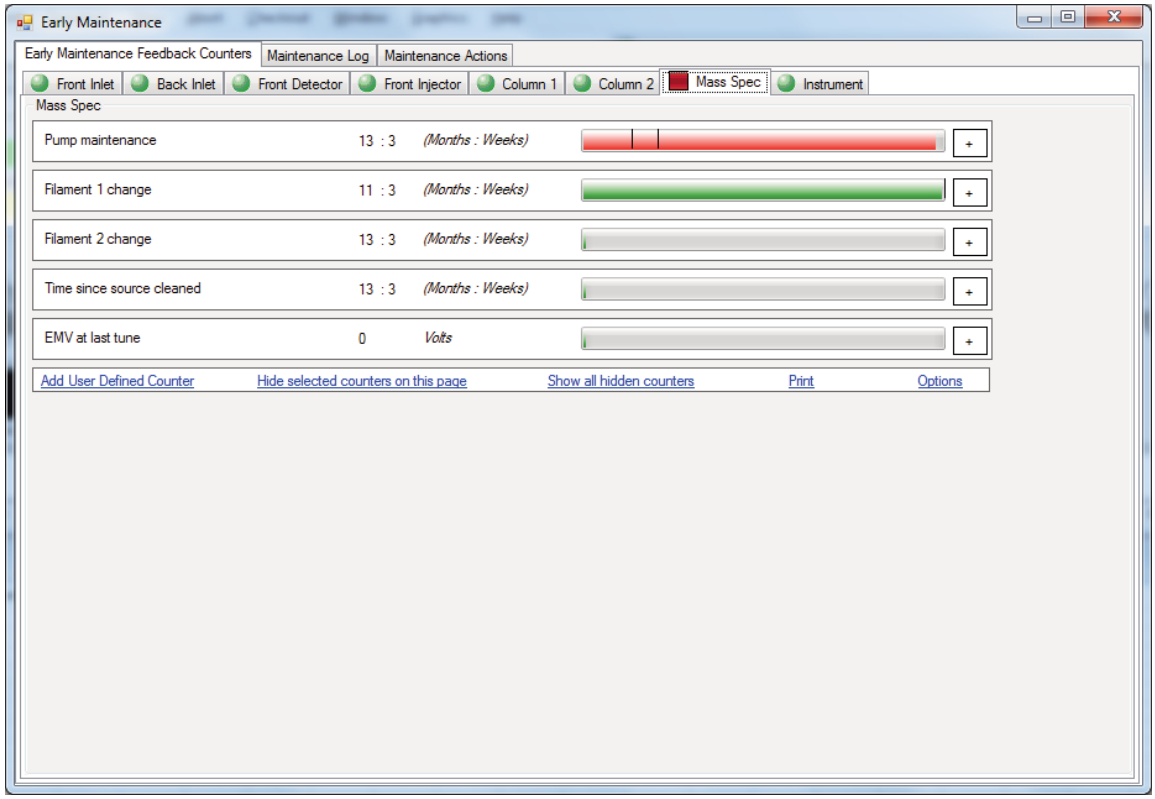

Figure 6. EMF (Early Maintenance Feedback) screen.

GC Method Translator

This feature is now fully integrated into the 7890B software (Figure 7). It facilitates the optimized translation of a method to alternative column dimensions or carrier gas. The translator will automatically update the method with the new optimized parameters with the simple click of a button.

The optimal fused-silica column dimensions for GC/MS are dependent on the particular application being run. The most common length and inner diameter for GC/MS are 30 meters and 0.25 mm respectively. The chromatographic resolution of an analysis can be improved if a smaller diameter column (such as 0.18 mm) is used while maintaining the same run time as the larger diameter. If faster chromatography is desirable, the analysis time can be shortened while maintaining the same resolution as the larger bore column. The built-in translator optimizes the method based on which outcome is specified, higher resolution or faster run-time.

Additionally, there is often a significant difference in sample capacity between a conventional column and a narrow bore column, and the new translator helps identify these cases, so that any capacity problems can be avoided.

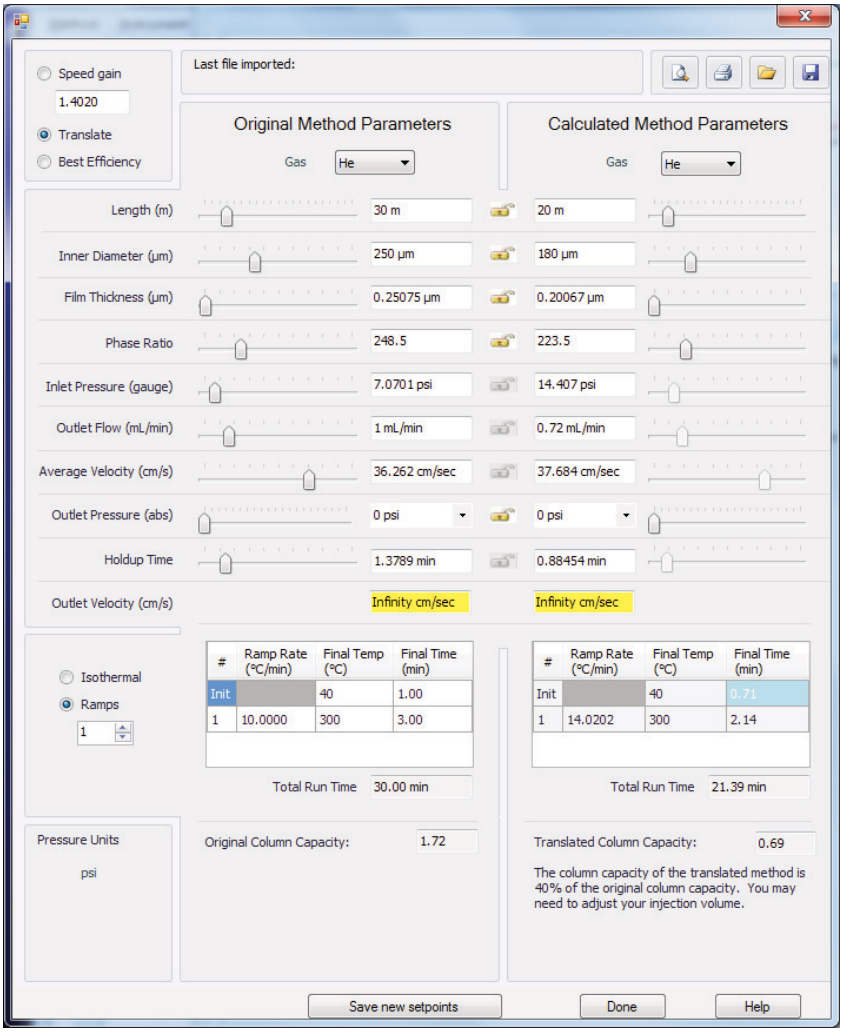

Figure 7. The GC Method Translator screen.

Gas Saver

The 7890 GC Gas Saver feature, which was introduced with the 6890 GC, is specified as part of the method. The basic purpose is to reduce the purge flow (Splitless Injection) or the split flow (Split Injection) during data acquisition, thus reducing gas usage. The optimum flow depends on the column flow mode, (e.g., Constant Flow/Pressure Mode, Ramp Flow/Pressure Mode), column oven temperature program (Final Oven Temp), and the column dimensions (Table 1).

Guidelines for optimal use of the Gas Saver are easy to follow:

- The lowest Gas Saver flow setting may cause inlet pressure (or flow) shutdown due to insufficient gas flow to the inlet. In order to properly optimize the Gas Saver flow, it is necessary to run the method and confirm the flow and pressure stability of the inlet.
- The saver time must be specified in the GC inlet settings (Figure 8).
- If the injection mode is Splitless, the saver time should be greater (0.2 minute or more) than the purge time.
- If the injection mode is Split, the time required for all samples in the inlet liner to be introduced to the column must be estimated. The approximate column introduction time can be calculated from the Inlet liner volume and the sum of column flow and split flow.

Table 1. Example of Suggested Gas Saver Parameters

	Without gas saver	With gas saver
Injection mode	Splitless	Splitless
Purge flow	50 mL/min at 1.5 minutes	50 mL/min at 1.5 minutes
Column flow	1 mL/min	1 mL/min
GC run time	30 minutes	30 minutes
Gas Saver	Off	On, saver flow 25 mL/min at 2minutes
Total gas consumption	1,425 mL	755 mL*

*Depending on the ion source temperature, quadrupole temperature and MSD Vent method settings

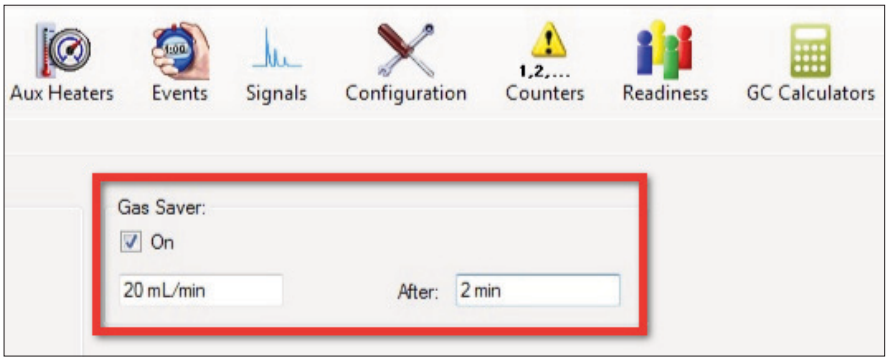

Figure 8. Gas saver setting screen.

Summary

The Integrated Intelligence of the Agilent 7890B GC and 5977A GC/MSD has made it much easier to set up and routinely use these energy saving, higher productivity features. Start using Sleep/Wake, Gas Saver, Early Maintenance Feedback and Fast Vent as soon as possible. These features will lower your cost of operation and ensure maximum uptime for your GC or GC/MSD system, without compromising performance.

A summary of these features, as well as additional information regarding the use of the instrument, can also be found in "Agilent 7890B Gas Chromatograph-Getting Started", which is shipped with every 7890B GC instrument.

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