Swafer Utility Software

Introduction

PerkinElmer's new Swafer™ micro-channel flow technology is an innovative and user-friendly approach for flow-switching applications – it delivers unparalleled hardware and application flexibility, expanding the capabilities of capillary gas chromatography. This exciting new technology can enhance most analytical laboratories' productivity – in specific configurations and high-throughput environments, the Swafer can pay for itself in a couple of weeks.

To help customers maximize the benefits of this new technology, PerkinElmer is making available, free of charge, the Swafer Utility Software as a value-added resource for customers. The new software guides users through the installation process, and helps them maximize the benefits of the technology almost immediately.

The Swafer Utility Software (SUS) is the perfect tool to assist users in setting up and characterizing the performance of their PerkinElmer® GC systems that are enhanced with Swafer technology. The success of analytical methods can be enhanced by choosing the appropriate restrictor tubing and applying suitable gas pressures during initial setup.

The Swafer utility software uses a series of graphic based calculators, making the right choices about complex plumbing networks straightforward and easy to understand.

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For the Better

Software Capabilities

The software comprises a collection of calculators: each tailored to suit the various Swafer configurations.

These calculators use complex algorithms (patents pending) to predict flow rates through serially connected columns, restrictors and transfer lines which may be held at differing temperatures within the GC's oven, injector and detector.

The software can perform the following:

• Provide support and information for the setup of the 15 Swafer hardware configurations

• Calculate flow rates through columns and restrictors for chosen geometry, carrier gas, pressures and temperatures. These calculations take into account the effect of injector and detector temperature and pressure.

• Calculate restrictor length necessary to deliver a required flow rate.

• Calculate the pressure necessary to deliver a required flow rate through a restrictor or column of known geometry.

• Calculate the geometry of a restrictor needed to flow-balance a column.

• Calculate flow rates and pressures through the primary column when connected to the injection system via a transfer line or retention gap.

• Model the behavior of the system as the GC oven temperature is changed.

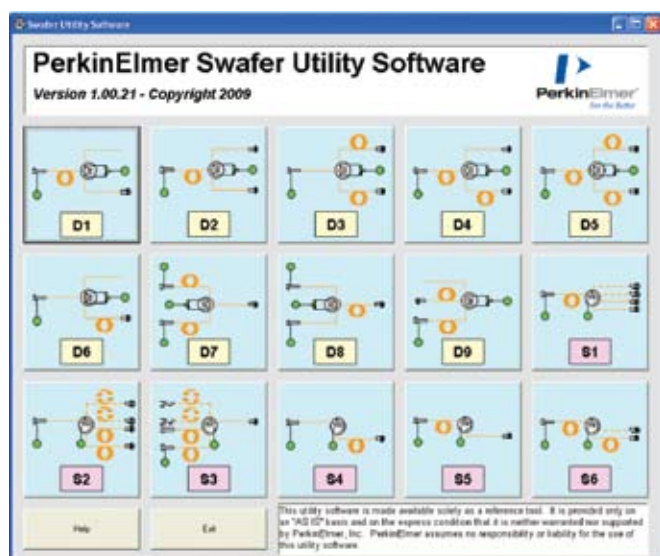• Calculate the internal diameter of a column or restrictor tube.

Figure 1. The SUS main page.

Software Overview

Figure 1 shows the main SUS screen with calculators for each of the 15 Swafer configurations accessible from its own button.

When a button is pressed, the associated calculator for that particular configuration is displayed. For example, Figure 2 shows the D-Swafer heartcutting calculator that appears when the D4 button is pressed.
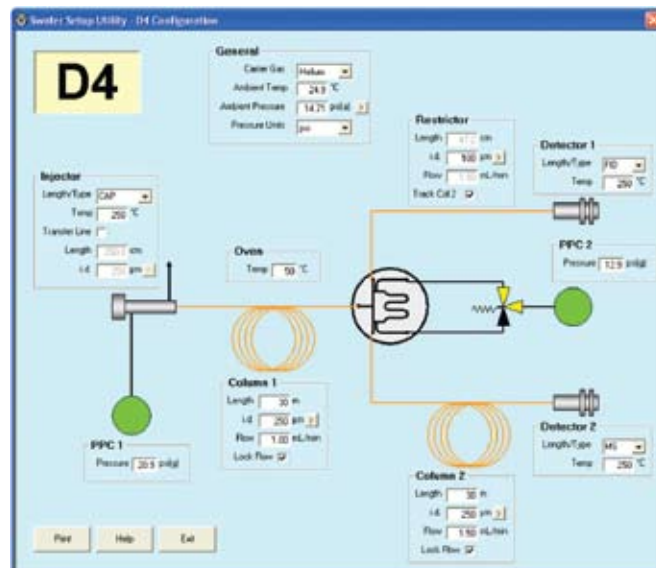

Figure 2. The D4 calculator to support the heartcutting configuration.

The user would normally start by entering the dimensions of the columns to be used and the respective flow rates required through each. The type of injector and detectors being used are now selected. The internal diameter of the restrictor is now entered and, if the tracking option is selected, the length of the restrictor needed to deliver a flow rate matching the column flow rate and the necessary gas pressures at the injector and the Swafer are automatically calculated. The oven temperature can be modified to see how the suggested restrictor length and the pressure settings change with temperature. Each entry value may be scrolled using the keyboard's arrow keys to visualize gradual effects and to fine-tune the settings.

In this way, the necessary settings for a complex application such as heartcutting can be established in just a few minutes. The results take in to account the effects of injector and detector temperatures on the flow rates and also the effect of the vacuum at the column outlet with an MS detector.

The calculations need to take into account the ambient temperature and pressure. These may be read from a local thermometer and barometer. Barometric readings are normally expressed in different units from those used in GC and so a calculator to convert such units is provided as shown in Figure 3.
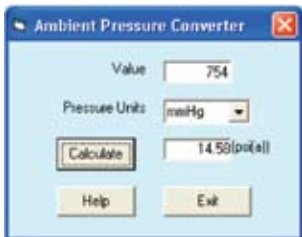

Figure 3. The ambient pressure unit converter.

The accuracy of the calculated results depends heavily on the accuracy of the values entered for the length and inner diameters of the restrictors and columns. The calculator shown in Figure 4 is provided to enable the inner diameter of a restrictor or column to be accurately determined experimentally from flow versus pressure measurements across the restrictor or column.
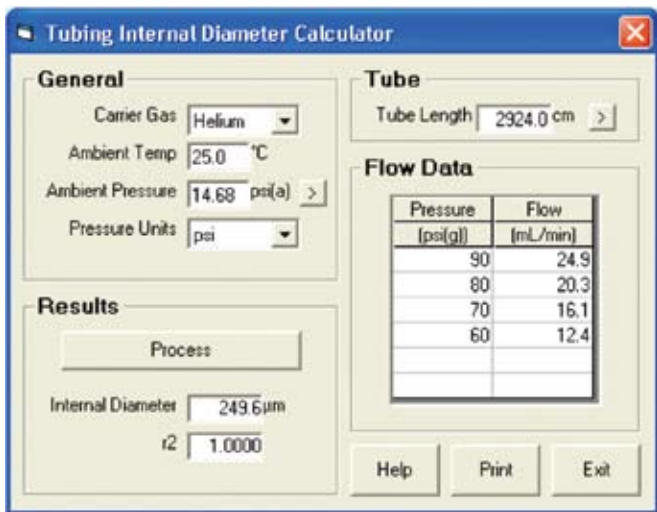

Figure 4. The internal diameter calculator.

There is even a calculator to determine the length of a column by counting the number of coils in it as shown in Figure 5.
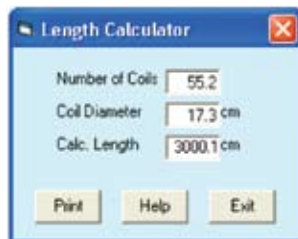

Figure 5. The column length calculator.

Figure 6 shows the D8 calculator for another configuration of the D-Swafer. In this case, the system is being used to switch the inlet of a single column between a capillary (split/splitless) injector and a headspace (HS) system. The calculator calculates the necessary pressure at each of the two inlets to deliver the required flow rate. The calculation takes into account the effects of the heated transfer line on the gas flow rate from the HS system. During operation, only one of the inlets would be set to this pressure: the other would have a reduced pressure to disable it.
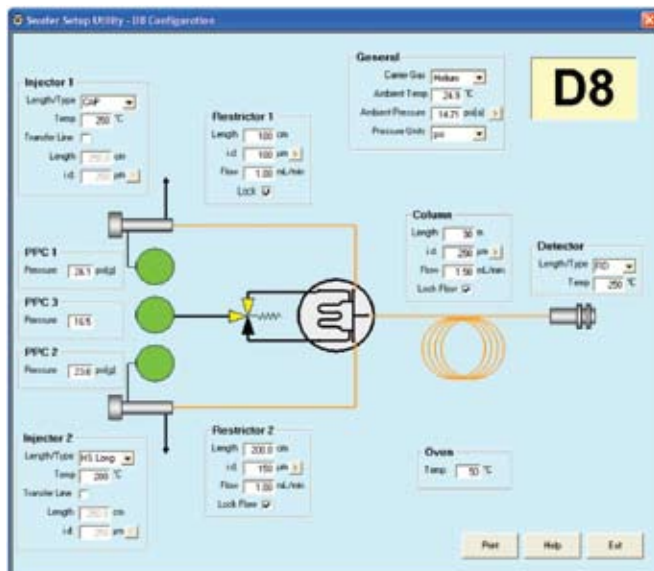

Figure 6. The D8 calculator for inlet selection.

Figure 7 shows the S1 calculator that supports an S-Swafer configuration in which the effluent from a single column may be split between two or more detectors. Using this calculator, the user is able to choose flow rates into each detector and thus the split ratios between them.
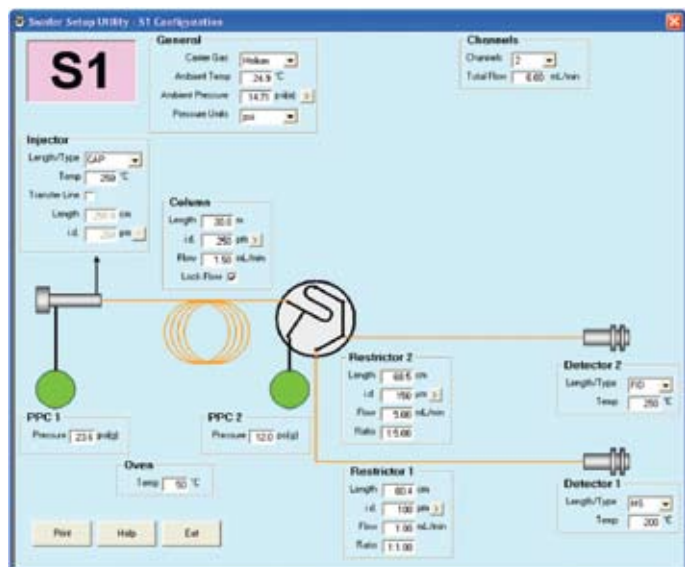

Figure 7. The S1 calculator for detector splitting.

Configurations like S1 are scalable to different number of detectors shown in Figure 8. The fourth detector is empty and could be used, for instance, to supply an odor port.
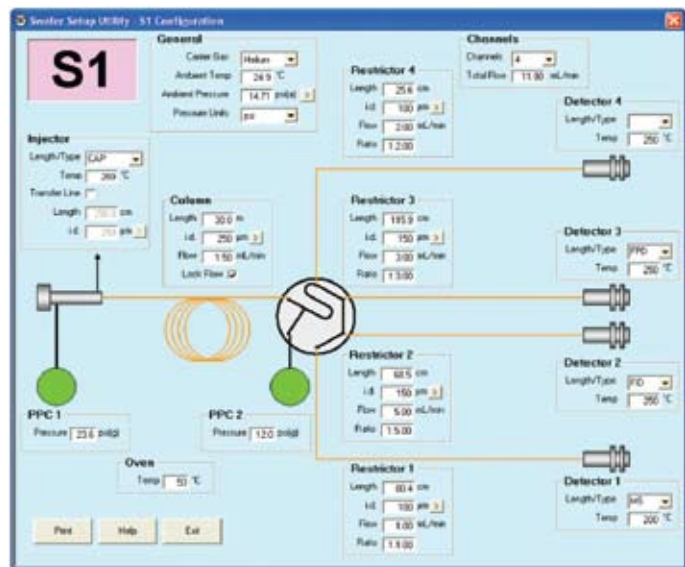

Figure 8. The S1 calculator with 4 detectors selected.

Documentation

There is a comprehensive help file that may be invoked by pressing the F1 key when any active field is selected.

A full user manual is installed during the software installation.

Finally, a special version of the Swafer Cookbook is also installed during the SUS installation. This cookbook provides the users with guidance on how to choose the appropriate Swafer configurations and techniques to suit the analysis required. In this version, links are provided to the SUS as shown in the extract from the Cookbook shown in Figure 9. When this link button is pressed, that particular calculator will be loaded and run. This interactive capability greatly simplified the learning process and operation of the Swafer systems.
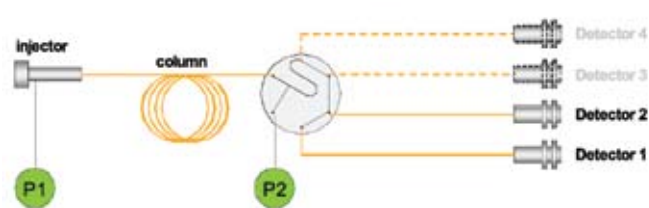

Figure 9. Example diagram from the Swafer Cookbook showing the link to the Swafer Utility Software.

Availability

The Swafer Utility Software will be supplied to purchasers of the Swafer systems.

It will also be available, free of charge, on request from your PerkinElmer representative and through perkinelmer.com.

For a complete listing of our global offices, visit www.perkinelmer.com/ContactUs

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