

The **MiniMizer HPLC Solvent Recycler** connects to any HPLC system and decreases solvent waste up to 95%. The MiniMizer is so effective that the unit pays for itself in just a few months on most HPLCs being run full-time. The MiniMizer is a sophisticated means of recycling HPLC solvents which have not been "contaminated" by sample peaks. In most analyses, a very large proportion of the mobile phase remains completely pure. The MiniMizer allows recycling of this pure mobile phase, saving up to 95% in solvent costs and even more in disposal costs. In addition to saving money, the MiniMizer reduces the time and effort required to make up eluents.



The MiniMizer controls a post-detector switching valve which directs the solvent flow to either a waste or recycle reservoir based on solvent purity. Simply stated, when the detector shows a baseline signal, the MiniMizer recycles the solvent. When the detector signal moves above or below baseline, (e.g. when a peak is eluting), the MiniMizer switches the effluent to the waste reservoir until the "contaminant" peak elutes and the detector response returns to baseline.

**For
Isocratic
HPLC**

Recycles "pure" solvent in-between HPLC peaks and when on "stand-by"

Pays for itself in months

Less disposal problems with waste solvent

The MiniMizer has many advantages over competing recycling machines. It provides more efficient solvent recycling, while being easier to operate, at a fraction of the cost of other recyclers. For labs who must answer to regulatory authorities, the MiniMizer is the only recycler which monitors the actual physical position of the solvent switching valve. This option detects changes in the position of the switching valve and signals a chart recorder or integrator to mark the chromatogram when the valve switches from recycle to waste and back to recycle. The VPV provides the user with a hard copy of the recycling profile for archiving and regulatory compliance.

Additionally, the MiniMizer has a fail-safe design which puts the valve in waste position in the event of power loss to the recycling device. Other recyclers leave the flow stream in the recycle position when power to the unit is off - a potentially "disastrous" condition. Again, the MiniMizer costs a fraction of what competing units cost while providing better solvent recycling.

The MiniMizer has an exceptionally friendly user interface, which belies the device's underlying sophistication. The MiniMizer's programmers were given the challenge of creating an operating system which would require little use of an operating manual. They succeeded in producing a very logical system which any user can master in a matter of minutes. The MiniMizer is a light, compact unit (6.5" x 4.9" x 1.7") with a small footprint that offers



a wide variety of mounting and placement options. The MiniMizer Control Unit can be placed on a benchtop or side-mounted on the HPLC using optional mounting brackets. The MiniMizer is compatible with all HPLC detectors. A single cable connects the MiniMizer to the detector, and all necessary electrical connections and system settings can be completed in minutes. Each MiniMizer is supplied with IQ and OQ (installation and operational qualifications, respectively) information, along with step by step instructions for installing and operating the instrument. The MiniMizer is a durable device which is simple to maintain and very inexpensive to own and operate usually paying for itself in a matter of weeks or just a few months. Every MiniMizer is supplied with our guarantee of satisfaction.

Ordering Information	
Order No.	Description
9500	MiniMizer Solvent Recycler (Includes MiniMizer Control Unit, Standard Spade-Lug Detector Connector Cable, and Standard Bench Mounting Bracket)
9510	Detector Cable for Hewlett Packard Detectors
9512	Extension Cable for Remote Mounting of MiniMizer valve
9514	Control Unit Mounting Bracket (Wall or HPLC Mount)
9520	VPV Validation Compliance Kit
9525	MiniMizer Solvent Recycler with VPV Validation Compliance Kit (Includes Part Nos 9500, 9512, 9514, and 9520. Save \$50!)

Commonly Asked Questions About Solvent Recycling

How do I validate the MiniMizer?

The MiniMizer can be validated like any other instrument in your laboratory. The MiniMizer is used post-detector and has absolutely no effect qualitatively or quantitatively on the analysis. This fact is simple to validate and MetaChem provides specific instructions and suggestions for validation along with the MiniMizer.

If the sample solvent is different from the eluent solvent, can I still recycle the mobile phase?

Yes. Using a solvent other than the eluent to dissolve your sample will result in a system peak at the void volume. The MiniMizer is just as sensitive as the detector and responds to even the smallest system peaks if so desired. Hence, the sample solvent is detected as a solvent system peak and the MiniMizer directs this contaminated solvent to the waste reservoir.

If the trigger value is set to, say, 0.001 AU, won't the eluent be contaminated by that amount each time a peak elutes?

No. Remember that the MiniMizer is placed downstream of the detector flow cell. There is a finite delay between the time a peak is recognized in the flow cell of the detector and when the peak actually reaches the MiniMizer valve, allowing 100% of the contaminant to be eliminated from the recycled solvent. Unlike other recyclers, the MiniMizer responds extremely quickly to electronic signals from the detector. Therefore, the MiniMizer is able to switch the valve to the waste position well in advance of the arrival of the contaminating peak at the valve.

What is the purpose of the "DELAY TIME"?

The delay time, as shown in the diagram at right, is the length of time AFTER the detector signal falls below the trigger level that the valve is left in WASTE position. For example, if the valve trigger level is set to .001 AU and the delay time is set to 10 seconds, the valve will stay in the waste position for 10 seconds after the peak falls below .001AU.

The purpose of the delay time is to ensure that no contaminants (e.g. sample constituents) are recycled from the tail end of the peak. Since it takes some finite period of time for the peak to travel from the detector flow cell through the capillary connective tubing to the MiniMizer Valve, a delay time must be programmed into the MiniMizer to ensure proper recycling. The proper delay time is easily determined for any system and is easily programmed into the MiniMizer. The multi-line display of the on the face of the unit displays the delay time any time the unit is in run mode.

If there are undetected contaminants in the sample, won't these be recycled and build up in the mobile phase?

If you suspect the presence of undetected contaminants in the sample, we suggest creating and storing a stock solution of mobile phase and then recycling a small amount of solvent each day, say, 100 ml. This will allow significant solvent savings without the possibility of contaminants accumulating in a large solvent reservoir to undesirable levels.

Is there any day to day set-up or maintenance required of the MiniMizer?

No. After installation, the MiniMizer requires very little attention from the operator. Beyond flushing buffer salts from the valve for long term storage, the MiniMizer requires no special maintenance. Daily set-up is generally limited to simply turning the unit on.

The following information was provided by a customer who conducted an independent study of the efficacy of solvent recycling for a high-volume QC laboratory.

Purpose

This study is intended to set forth a protocol for the evaluation of the HPLC Solvent MiniMizer.

Background

The QC lab has one HPLC system that is used for in-process samples exclusively. It is therefore characterized as a high volume, high throughput system and is responsible for a high consumption of mobile phase solvent. The premise is that by recycling mobile phase throughout an entire shift at a minimum, or for two weeks at the maximum, the lab will be able to cut costs both in the purchase of solvents and in their disposal by reducing the amount of solvent used.

Concerns

A major concern of the QC lab management and staff is the possibility of sample carryover into the mobile phase reservoir. It could cause unreliable chromatography as the mobile phase is recycled.

Protocol

The evaluation of the MiniMizer will utilize two Hewlett-Packard, Model 1050 HPLC's. The control system to be used is asset # [xx]. The test system to be used is asset # [yy]. The two columns to be used for this evaluation will come from the same manufacturer. The type and serial number of each column will be documented before the evaluation is started.

The MiniMizer will be connected to the test system as specified by the manufacturer. All the results obtained from this system will be documented for the evaluation process; however, these results will not be reported in a laboratory notebook or used for the release of any product. They are to be used for information purposes only. The In-process chemist on shift will prepare all Vitamin E samples brought into the lab as specified in the test procedure. The only difference is that the standards and samples will be loaded onto the autosampler of both the control system and the test system. The control system will not reuse mobile phase; it will all go to the waste container. The test system will use the MiniMizer to recycle mobile phase; sending only that portion of the mobile phase that is contaminated to the waste container.

The evaluation will take place over a period of 2 weeks using the same mobile phase preparation (2 liters) on the test system for the entire period. The two systems will be evaluated daily to determine if there are any major problems that will skew the evaluation. Then, at the end of the evaluation period, all the data collected from both the control system and the test system will be compared. Important points of interest include relative peak retention times, peak resolution, and difference of % label claim of the actives analyzed.

Data Analysis

It was found that the % difference between any of the two compared results was no greater than 2.0% throughout the study. This is in good agreement with the accepted % difference as it applies to lab-to-lab transfers and differences between HPLC systems.

At the end of the study there was approximately 310 mL of mobile phase remaining. A small amount of this was scanned on a UV from 205 to 350 nm to determine if there was any appreciable amount of sample carryover. When compared with unadulterated mobile phase, it was apparent that there was some carryover at other wavelengths besides the 280nm that the HPLC data was collected at. There was also about 0.004 AU observed at 280nm in the recycled mobile phase. **It can be determined that it is an unappreciable amount since the data collected on the last day of the study varies only 1.1% difference at the most which can be attributed to the difference between columns and systems.**

Sample chromatograms of the first standard injection on the first day of the study and the last standard injection on the last day of the study show that there is very little variance in retention time or peak shape.

The slight difference in retention times may be due in part to mobile phase composition, however it is more likely that it is a difference due to ambient temperature.

It can be seen that the peak shapes are still sharp and easily quantifiable even after 2 weeks of recycling. It should be noted that the study was ended after day 9 because that is when the mobile phase ran out. It was necessary to end the study with enough mobile phase left to run a UV scan on to determine any significant amount of carryover to the reservoir.

Additionally, it should be noted that the MiniMizer data was collected using the QC computer data collection system rather than the integrator. This was done for ease of integration and calculation.

The integrator printouts for the test system are available for inspection of the tic marks that denote the MiniMizer valve switching (VPV option).

The VPV option is a validation tool that creates a hard copy of the recycling profile. However, the integration parameters of the HP integrator were not compatible with the VPV system. The superimposed negative tic marks caused incorrect area calculations with the HP integrator. It was not a problem with the computer data collection system. This, however, will not be a factor in normal use of the solvent recycler either with the use of integrators or the computer data collection system because the VPV unit will not be connected. The IQ/OQ forms provided by MetaChem were completed.

Conclusion

The study was initially planned for a 2-week time period but was ended one day early because of lack of sufficient mobile phase.

However, due to the small amount of variance between the test and control system even on the last day of the study, it would not be unreasonable to say that as long as there is sufficient mobile phase to recycle, it is good for a 2-week time period.

It is recommended that any mobile phase left at the end of the 2-week cut-off be disposed of and fresh mobile phase be prepared for future analysis.

For recycler operation on this system and this specified product the limits are as follows:

- (a) no more than 2 liters of mobile phase should be recycled, and
- (b) mobile phase should not be recycled for more than 2 weeks at a time before disposal.

If these two guidelines are followed, the MiniMizer solvent recycler should be a valuable commodity to the QC laboratory efforts in cost-cutting as well as in its efforts to operate more efficiently.