Waters Alliance® System

No Compromise Solvent Management

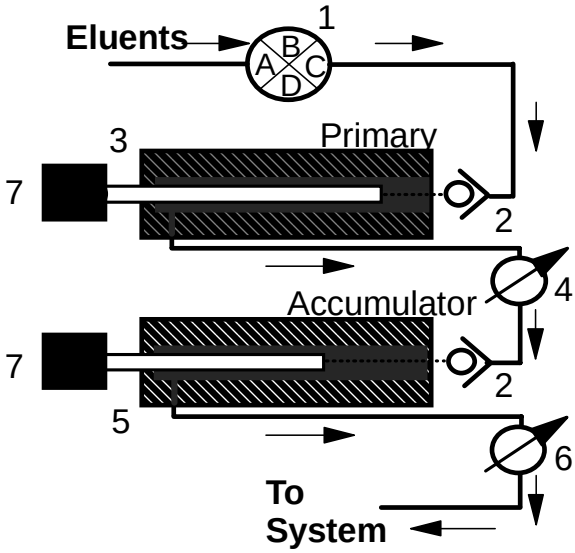
Performance PerSPECtives

Serial Flow Design

The serial flow path of the Waters Alliance Separations Module provides some obvious and not so obvious benefits to the solvent management process. From the schematic below, it can be seen that only two check valves are required with this design. This enhances reliability. Also, the first in, first out flow design provides delivery of accurate and reproducible gradients. Perhaps the most significant benefits of this serial flow design are realized through the unique implementation of this concept. By using independent piston drive motors and dual pressure transducers together with sophisticated control software, the movement of the pistons can be precisely controlled at all times to provide smooth and reproducible flow.

High and Low Pressure Mixing

Solvent proportioning in the Waters Alliance Separations Module is at low pressure. The advanced Synchronized Composition Control software coordinates the gradient proportioning valve with the piston volume and flow rate for reproducible gradient performance. When the primary head fills, mixing occurs at low pressure. The delivery stroke of the primary piston services the fill cycle of the accumulator and simultaneously keeps flow to the system constant. The mixing that occurs in this phase of the solvent delivery is at system (high) pressure. By this design, the Alliance Separations Module effectively and efficiently mixes proportioned solvents at both low and high pressure, and does so without the use of added mixers (which also add system volume). This overall design results in accurate and reproducible automated solvent composition blending and gradient formation.



Critical Functions

1. Gradient proportioning valve (GPV)
2. Check valves.
3. Primary head plunger
4. Primary pressure transducer
5. Accumulator head plunger
6. System pressure transducer
7. Independent piston drive motors

Waters

Waters Corporation 34 Maple Street Milford, MA 01757 508 478 2000

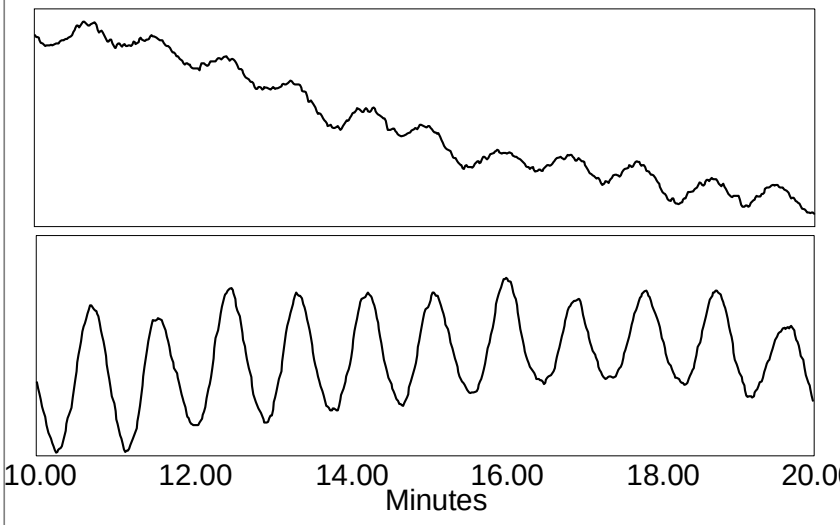


Figure 1

Traditional System:
Volume = 1700mL
Ripple = 0.10mV

Figure 2

Modified Traditional System:
Volume ~ 900mL
Ripple = 0.40mV

Incomplete mixing in HPLC solvent delivery results in compositional ripple. Ripple manifests itself as either baseline noise or irreproducible retention times. All of these figures were generated under the same conditions. Figure 1 is a traditional single pump gradient system with 1.7mL of volume. Figure 2 is the same system modified to reduce volume (~900 mL). Note that with traditional HPLC pumps, we sacrifice mixing and generate more compositional ripple when we attempt to minimize volume. Figure 3 is the Waters Alliance Separations Module with a 50µL piston stroke and ~550 mL of volume. This demonstrates the effective and efficient mixing that occurs in the Waters Alliance. Figure 4 demonstrates that we can control the amount of mixing with the Alliance solvent management system by programming a larger (100µL) piston volume to minimize the ripple.

<u>Conditions</u>
Automated solvent blending: 75/25
A = H2O + 0.1% TFA
B = CH3CN + 0.1% TFA
1.0 mL/min, UV @ 214nm
All Figures = 0.52mV FS y-axis

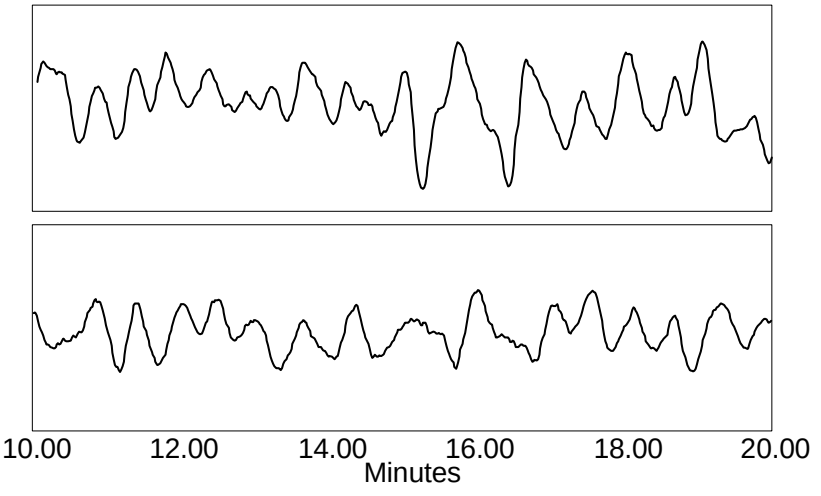


Figure 3

Alliance Separations Module
50µL Piston Volume
Volume ~550mL
Ripple = 0.38mV

Figure 4

Alliance Separation Module
100µL Piston Volume
Volume ~ 600mL
Ripple = 0.20mV