MICROSOLV

Residual Volume with Autosampler Vials Definition - HPLC Primer

Date: 10-JANUARY-2013 Last Updated: 15-NOVEMBER-2025

Definition and Importance

Residual volume refers to the amount of liquid that remains in an autosampler vial after the syringe needle has completed its programmed draw. This occurs because the needle does not reach the absolute bottom of the vial during injection. As a result, a small volume of sample is left behind—this is the residual volume.

Understanding and minimizing residual volume is important when:

- Working with limited or valuable samples
- Performing trace-level analysis
- Ensuring maximum sample utilization

Factors That Influence Residual Volume

1. Vial Geometry
    - Flat-bottom vials typically retain more residual volume.
    - Tapered or conical-bottom vials reduce residual volume by allowing the needle to access more of the sample.
2. Autosampler Design
    - Different autosamplers have varying needle depths and geometries.
    - Some use center-bottom draw needles, while others use side-port or offset designs, which can affect how much sample is accessible.
3. Needle Insertion Depth
    - The programmed depth of needle insertion varies by instrument and method.
    - Shallower needle depths will leave more residual volume.

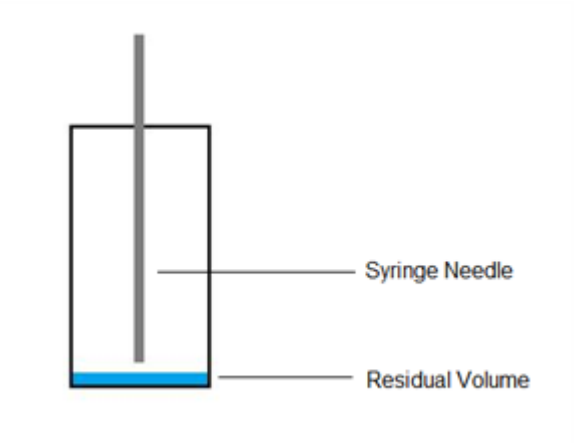
Key Consideration

Residual volume is not a fixed value—it is instrument- and method-dependent. While vial design can help reduce it, the actual residual volume will vary based on:

- The autosampler model
- Needle type and insertion depth
- Sample volume and vial fill level

Visual Reference

To better understand how residual volume forms, the following diagram illustrates the point at which the autosampler needle can no longer aspirate liquid from the vial:



Unlike other vials, the AQ™ and RSA™ brand Vials have a specification for bottom height. This specific tolerance of the bottom height allows you to bring the needle down to the lowest position necessary.

Low Residual Volume Vial information
RSA Vials Product Page
Inserts Product Page

MicroSolv Technology Corporation
9158 Industrial Blvd. NE, Leland, NC 28451
Tel: (732) 380-8900
Fax: (910) 769-9435
Email: customers@mtc-usa.com
Website: www.mtc-usa.com