

# Methanol Vial Stability Study – Client Summary

## Objective

The objective of this year-long study was to evaluate the stability and viability of methanol vials commonly used in volatile organic compound (VOC) analysis, when stored under various environmental conditions. Methanol vials are critical in environmental sampling and must maintain purity to ensure the validity of analytical results. Over time, environmental factors such as temperature fluctuations, airborne contaminants, humidity, and proximity to chemicals may compromise the integrity of the methanol, potentially leading to false positives or degraded results.

To address this concern, AGAT Laboratories initiated a controlled study to:

- Simulate realistic storage scenarios that reflect both ideal and challenging client storage environments.
- Provide clients with science-based recommendations for storage practices and shelf-life expectations.
- Evaluate whether older methanol vials (e.g., stored since 2019) remain viable for use.
- Investigate contamination risks through intentional exposure to acetone as a common lab solvent.

By conducting this study, AGAT aims to ensure client confidence in using methanol vials stored for extended periods, and to establish guidelines for safe and reliable sample preservation practices.

## Study Design

The study was conducted at the Environmental lab in Calgary at 2910 12st NE (2910)

- Sample Size: 120 methanol vials (in 4 batches of 30 vials)
- Testing Schedule: Bi-weekly (26 rounds in total)
- Analysis Performed: VOC scan (e.g., Acetone, Benzene, Toluene, Xylenes) and physical inspection (volume check, weight, etc.)

| Storage Location          | Description   | Purpose  |
|---------------------------|---|--|
| 2910 Office Area          | Indoor office environment with stable temperature and no contaminants                         | Control group to assess baseline conditions with minimal environmental variability |
| 2910 Back Warehouse       | Typical warehouse setting with temperature fluctuations and possible exposures                | Simulates common client storage conditions (e.g., alongside supplies)              |
| 2910 Legal Sample Fridge  | Cold, stable, and dry storage in a designated laboratory refrigerator                         | Evaluates long-term storage in chilled conditions                                  |
| 2910 Organics Fume Hood   | Lab area exposed to various volatile organics and environmental factors                       | Tests impact of potential airborne contamination sources                           |
| 2019 Bay Storage (Legacy) | Vials from 2019 stored in ziplock bags within insulated containers, exposed to fumes and heat | Assesses long-term viability under uncontrolled conditions                         |

## Key Findings

- **VOC Stability:** Through 52 weeks, no VOC contamination was detected in any of the four main storage conditions. This indicates strong stability of methanol vials when stored under typical lab and warehouse conditions—even with moderate temperature fluctuations.
- **Legacy Vials (2019):** Vials stored for ~5 years in non-ideal conditions (bay with exposure to vehicle fumes and heat) showed no VOC hits, demonstrating long-term resilience when sealed and properly handled. Vials were stored in resealable plastic bags, organized within individual insulated carrying cases, and then placed in an enclosed plastic container. This multi-layered approach provided several barriers against potential contamination.
- **Extended Testing – Forced Contamination Scenarios:** In the final weeks of the study, AGAT introduced new storage conditions intended to simulate high-risk contamination environments:
  - Methanol stored with sealed and partially open Acetone vials
  - Caps in varying positions (fully closed, loosely fitted, completely removed)
  - Included Deionized (DI) water samples for comparison
  - Result: Unsealed Methanol vials stored near an open Acetone vial showed Acetone contamination within a week, as did DI water samples. This confirmed that direct proximity to open solvents can compromise sample integrity.

## Conclusion

The Methanol Vial Stability Study demonstrated that the methanol vials maintain their chemical stability and remain contamination free when kept in sealed containers under conditions simulating those of a laboratory or field environment. Even vials stored in uncontrolled environments for multiple years (e.g., since 2019) maintained their integrity, provided the seal remained intact and the methanol level stayed above the designated 10 mL line.

The introduction of forced contamination scenarios confirmed that **direct exposure to open solvent containers** (specifically acetone) poses a contamination risk — not only to methanol vials but also to water samples stored in the same environment.

This underlines the importance of proper segregation and sealing of materials during storage, transportation and handling.

Acetone was selected for this study because it represents a lighter, highly volatile compound commonly encountered in laboratory and field environments. Its relatively low boiling point and high vapor pressure make it more likely to volatilize into the atmosphere under normal conditions. By using acetone, the intent was to evaluate whether a compound of this nature could migrate into a nearby blank container through vapor transfer, rather than simply dissipating into the air. Demonstrating this behavior is important, as it highlights the potential for cross-contamination of samples when handling volatile substances.

## Recommendations

AGAT Laboratories recommends the following best practices for the storage and use of methanol vials:

### 1. Storage Duration:

- Methanol vials may be safely stored and used for up to 12 months, provided proper storage conditions are maintained. However, for storage periods exceeding 6 months, verification (as outlined below) is advised.

### 2. Storage Environment:

- Store vials in sealed containers in dry, temperature-stable environments.
- Avoid proximity to open solvents, chemical fumes, or highly volatile compounds.
- Minimize vibration, dust, and humidity exposure.

### 3. Sealing & Handling:

- Ensure vials are tightly sealed at all times.
- Do not use vials with methanol levels below the 10 mL indicator line.

### 4. Verification:

- For any vials stored for more than 6 months, AGAT strongly recommends submitting a solvent blank for VOC screening to validate the methanol's continued viability before use in sampling or analysis.

### 5. Labeling & Tracking:

- Maintain clear records of vial batch numbers, storage conditions, and durations to ensure traceability and quality control.