

Weighing methods

Four vs. ten weighings compared

Abstract

When evaluating pipette performance, choosing one method over another may have a significant impact on the quality of the data obtained and the time required to obtain the results. One such choice is deciding on the number of weighings necessary to determine pipette inaccuracy and imprecision. The purpose of this report is to measure the difference between the ten versus four weighing method for a typical population of in-service pipettes, and determine its effect on the quality of the results obtained.

In-service pipettes

In-service pipettes are field pipettes of various ages from various manufacturers that were returned to RAININ for validation. Pipettes were divided into two groups: those determined to be functional (Non-Preventive Maintenance group), and those first subjected to a preventive maintenance program¹, then determined to be functional (Preventive Maintenance group).

Test procedure

1. Determine² the inaccuracy and imprecision value of each pipette from the non-preventive maintenance group at three volume settings (low, middle and high) using the ten weighing method.
2. Compare results and ensure compliance with manufacturer's specifications.
3. Re-analyze the ten weighing results by accepting the first four weighings only at each volume setting.
4. Tally the number of pipettes passing the four weighing method and compare.
5. Repeat steps 1 through 4 for the preventive maintenance group and compare.

Conclusion

The risk of rejecting conforming pipettes based on the four weighing method would be increased by 12% for the non-preventive maintenance group, and only 1% for the preventive maintenance group. In each case, the relative increase in risk should be measured against the additional time required (250% more) to obtain data for ten weighings.

Results

Comparison of ten vs. four weighing method by group

Pipette group	Pipettes from 10 weighing method	Pipettes passing 4 weighing method	% Pipettes passing 4 weighing method
Non-Preventive Maintenance	1,886	1,653	87.6%
Preventive Maintenance	1,674	1,659	99.1%

1) Preventive Maintenance (PM) is a feature of RAININ's Performance Verification program. Pipettes in PM receive replacement seals every visit, shafts and pistons every three years. Non-PM pipettes are checked thoroughly for functionality but do not receive PM scheduled parts unless required during inspection and repair.

2) Gravimetric analysis was used as defined in RAININ's SOP AB-15 Factory-Approved Method for Evaluating Pipette Accuracy and Precision, © 1994 Printed in USA. © 2009 Rainin Instrument, LLC. TR-9804