

How are your pipettes performing today?

Surprising Statistics

How good are the pipettes that are being used in your lab right now? If a random spot check of those pipettes were done today, how many would be found to be performing up to specification – 100%, 75%, surely not less than 50%? Surprisingly, a study conducted a few years ago determined that fewer than 1 in 3 pipettes in use in the laboratory meet standards for precision and accuracy.¹

At Labtronics, we conducted our own survey to establish a better understanding of the accuracy/precision of pipettes being used by technicians. We contacted five calibration service providers and asked them the following question: “What percent of the regularly calibrated pipettes fail the ‘as found’ test?” (The ‘as found’ test is a regular calibration that is performed to assess the condition of the pipette before any adjustments, cleaning or part replacement takes place.) As this data was collected from companies in the business of calibrating pipettes, it represents a large number of pipettes, from a wide range of customers and covers many different brands.

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Again, the results were surprising. The reported number of failures ranged from a low of 20% to a high of 50%. On average 36% of the pipettes failed the ‘as found’ test (See Table 1). In conducting our survey, we learned that the ‘as found’ service is usually not requested for pipettes that will obviously fail, for example those with leaking tips. In other words the 36% failure rate reported in our survey reflects results for pipettes that were assumed to be in good condition.

Table 1 Percentage of pipettes failing the “as found” test

Calibration Service Provider #1	20%
Calibration Service Provider #2	40%
Calibration Service Provider #3	50%
Calibration Service Provider #4	50%
Calibration Service Provider #5	20%
Average	36%

When customers don’t request the “as found” test, the number of pipettes that need to be adjusted to pass calibration is even higher. In one case where 200 pipettes were calibrated at a single

university, “80% needed adjustments to obtain a pass”.

The large number of failures for the ‘as found’ measurement indicates that many pipettes being used no longer meet the accuracy or precision required. For laboratory owners these results show that for any analysis that involves pipettes, there is a very significant possibility that the test results will be compromised by the pipette.

The “as found” test shows that a pipette is not working properly at the time of testing. What it doesn’t indicate is at what point between the current test and the previous calibration, the pipette stopped operating within acceptable limits. Therefore all of the results from tests involving this pipette since the last calibration was performed, are now suspect. If the pipette is calibrated just once a year, an entire year’s worth of results are now suspect.

The Impact of Inaccurate Pipettes

This can have a dramatic and costly impact on a laboratory, depending on the use to which the pipette was put. If for example the pipette is used to add reagents for a test, the accuracy of the addition may not affect the analytical results and the consequences are minor. However if the pipette was used to measure out the amount of sample used in a test, then all analytical results for that test are now suspect.

At a minimum, the owner of a failed pipette needs to take the time to review how and when the pipette was used in order to determine which results are affected. As a result of this review, there may be a significant amount of analytical work that needs to be redone. When this cost is compared to the cost of calibration, it soon becomes clear that it is very cost effective to calibrate more regularly.

Accurately verifying which results are affected by a particular pipette can be difficult, if not impossible, unless there is a process in place to record the serial number of each pipette that is used for each test. This process can be best implemented using software for automated SOP control, such as NEXXIS from Labtronics Inc., to enforce the recording of pipette serial numbers, and to associate a pipette with each set of results. With a system like this in place, the laboratory has a simple, automated method for identifying the affected data.



How often should you calibrate?

Regulatory bodies do not provide a clear requirement for frequency of pipette calibration. GLP is vague saying that calibration should be frequent enough to assure data validity. The new ISO 8655 standard suggests users “test at regular intervals as part of their test equipment monitoring, for example every three months but at least once a year”.² The ISO standard goes on to say that the testing interval should be adjusted depending on the following criteria:

- accuracy requirements
- frequency of use
- number of operators
- number of dispensings
- nature of the liquid
- recommendations by suppliers

The calibration frequency depends primarily on how much the pipette is used, and the critical nature of the work it is used for. Monitoring and

controlling calibration frequency can be automated using software like NEXXIS ELN (Electronic Laboratory Notebook) to track pipette usage and to inform the user that a calibration needs to be performed after a specified number of pipettings. An alternative is to perform the ‘as found’ test with each calibration and reduce the test period to a point where most of the pipettes pass.

How are your pipettes performing today?

Most analytical equipment in the lab is calibrated on a daily or weekly basis. Pipettes that are used in situations where their performance can affect the results of analytical procedures are no different. Implementing regular testing and calibration of pipettes does not need to be a burden for the lab as there are products like Pipette Tracker and Pipette Tracker Pro from Labtronics Inc. (Figure 1), which can automate all of the scheduling, calculations and documentation associated with regular pipette calibration. Pipette Tracker even includes a “Quick Check” method that can be run on a weekly or even daily basis to verify that the pipette is still performing as expected.

Improving Pipette Performance

One of the calibration service providers that responded to our survey reported that there was a 30% reduction in ‘as found’ failures when pipettes were calibrated every 3 months instead of every 6 months. Clearly, reducing the interval for calibration checks can have a dramatic effect on the reliability of analytical results, effectively reducing or eliminating the costs associated with poorly performing pipettes. Accurately documenting the serial numbers of pipettes that are used for each analysis will reduce the cost and effort required for verifying which results may be affected by a failed pipette.

Laboratories that take advantage of software to automate the pipette calibrations and to control the execution of SOPs, will be able to better monitor and control pipette performance without having to tie up internal resources. With an effective, automated program in place they will be able to respond with confidence when someone asks, “How are your pipettes performing today?”

References

¹ Connors M, Curtis R. Pipetting error: a real problem with a simple solution, part 2. Am Lab News Dec 1999; 31(25):12.

² ISO 8655-1:2002(E). Part 1: terminology, general requirements and user recommendations. Section 7.3. Testing by the user.

Figure 1 Pipette Tracker automates the scheduling, calculations, and documentation associated with regular pipette calibration.



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Automatically*