

A buyer's guide to the systems approach to liquid handling

Most laboratories, regardless of discipline, conduct ongoing programmes of quality improvement. The main reasons for this include the pursuit of academic excellence and the ability to demonstrate high levels of competence, and thus gain accreditation from a regulatory body. Manufacturers have responded to this need by supplying solutions in the form of complete packages or adopting a systems approach to the problem presented by the customer. Customers benefit from this approach because they receive an integrated package that is not reliant on several manufacturers, negating the potential for shortfalls in quality, which can often be the case when trying to coordinate several service providers. Customers look for certain qualities in their providers, including the company's background, the performance of its products, and the ability to offer a high-value package.

In the clinical diagnostics industry, the manufacturer must be able to offer all components of the systems approach (Figure 1).



Fig. 1 The systems approach.

In small-volume liquid handling, pipetting and dispensing may at first appear to be straightforward. Below the surface, however, lies a science and art that, if not fully understood by the end user, could cause many pitfalls, impacting work dramatically.

Biohit (Helsinki, Finland) has adopted a systems approach to liquid handling, incorporating instruments, consumables and service.

Instrument Considerations

There are many criteria to consider when purchasing liquid handling system. Budget may play an important part in the decision-making process, possibly causing a bias toward the purchase of mechanical pipettes over the more 'expensive' programmable electronic variants.

However, one should take into account other factors, such as the types of samples that will be used, the accuracy and precision needed for the specific applications and the length of time the pipettes will be used. Taking these factors into account, the electronic option may become a viable alternative.

The pipette, whether mechanical or electronic, must be well balanced and light in weight. In the case of mechanical pipettes, the plunger should be light and smooth and tip ejection executed with a minimum of effort.

To illustrate this point, evaluations have been performed to assess the pressure needed to operate mechanical pipettes. It was found that with some manufacturers' units, up to 4 kg of pressure was needed to depress the plunger. If this is multiplied by what would be considered to be a day's work (i.e., 1000 pipetting movements), the pressure exerted by the operative equals that of the weight of an average elephant! Prolonged use of pipettes of this nature drastically increases the risk for work-related upper limb disorders (WRULD), the effects of which have been well documented.

Safety concerns should not be confined to the user, but should extend to the sample itself. Cross-contamination can be a major source of analytical error. If one is dealing with microbiological or PCR (polmerase chain reaction, **Hoffmann-La Roche, Inc.**, Nutley, NJ, USA) samples the need for zero carryover is paramount. A certain amount of security can be achieved with filter-equipped tips, but to ensure that the best possible precautions are taken to reduce contamination of the pipette's tip cone or barrel, the pipette should be designed to accomodate disposable tip cone filters (Figure 2).



Fig. 2 The Proline® range of electric pipettes with tip cone filters (Biohit).

Consumables: A Critical Factor

One could easily assume that once the hardware evaluations have been concluded and a decision has been made, pipette tips could be obtained from the cheapest vendor. This would not only contradict the systems approach, but also allow potentially detrimental performance variables to be introduced.

The pipette tip is an integral part of the liquid handling system and its material properties and fit will significantly impact the performance of the pipette. The quoted performance figures for a particular pipette will be based on the manufacturer's own tip or one endorsed by them. Thus, using what might appear to be an economic alternative could cause performance to fall outside expected system parameters.

Premium-quality tips will be produced from high-grade polypropylene, which is non-wettable, autoclavable and free of contaminating substances such as DNase and RNase. Their construction should be smooth and free from moulding flash, which can contribute to liquid retention and droplet formation.

The Final Factor: Service

The term 'service' in the systems approach is all-encompassing. It must take into account the quality and calibre of the staff who service the customer. The staff will have the knowledge and ability to ensure that buyers are getting the best possible results from their chosen products by supplying training on pipette handling and techniques. Support literature will be available to act as training guides for new recruits or to act as refreshers for trained personnel.

Regular, documented performance monitoring is necessary for all pipettes to ensure that they conform to their original specification. If they are found to fall outside of these criteria, recalibration will be necessary.

Whilst performance testing and calibration can be undertaken by laboratory personnel, many factors have to be taken into consideration. Continuity of quality performance can be ensured via a number of routes. The laboratory may choose to employ an independent accredited service company that is able to service, performance check and calibrate all styles of pipette. Alternatively, the pipette can be returned to the manufacturer (*Figure 3*).

For Biohit customers, if the latter route is chosen, the company's accredited pipette calibration laboratories can issue an internationally recognised certificate of calibration. This not only ensures high performance, but may also be a mandatory requirement for some laboratories (*Figure 4*).

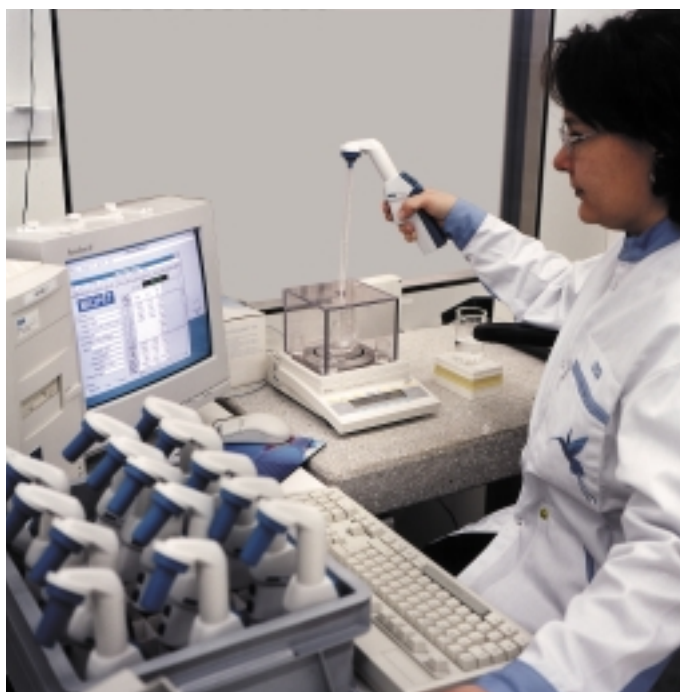


Fig. 3 Proline® XL pipetting aids undergoing performance testing.



K041 (EN 45001)

Fig. 4 FINAS accreditation seal.

Conclusion

There is a great deal more to choosing liquid handling products than just buying a pipette. By adopting the systems approach to purchasing products, buyers ensure that they are receiving a complete quality package incorporating instruments, consumables and service.

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