RAININ

Liquidator 96 ready-to-use manual benchtop system

The increasing demand for high-throughput workflows in life science research is accommodated by several large robotic platforms. A new manual benchtop system from Rainin, Liquidator 96, provides an economical approach to high-throughput pipetting without the need for any programming. With a small footprint, the instrument easily fits inside a laminar flow hood for sterile applications.

The need for higher-throughput experiments to deliver meaningful data has continued to grow over the years for a number of scientific disciplines and applications, supported by an expanding number of papers and scientific meetings that verify the difficulties and benefits associated with higher-throughput experiments.

High throughput is often viewed as a workflow that incorporates several techniques that can be integrated to allow a large number of samples to be processed and analyzed in as short a time period as possible. Each of the individual components within the workflow should be identical in format—for example, 96-well—to minimize the time associated with each step, and the expectation is that the entire process will result in a reliable and efficient stream of data.

Easy access to rapid, medium-scale operations

Many studies, often classified as medium-throughput, may not require the full-scale adoption of large robotic systems and can benefit from the direct access associated with benchtop platforms. With these smaller-footprint systems, experiments can be performed right next to the researcher, enabling instant access, direct control and faster results.

An example of a small footprint system is the new Liquidator 96 from Rainin, a manual, 96-well pipetting system that provides the researcher with instant access to liquid handling in a variety of 96-well plates (deep-well, chemotaxis plates) and 384-well plates (**Fig. 1**). Compared with large robotic platforms that often do not reside in the lab, benchtop systems are effective tools that support the need for immediate results. Experiments that can benefit from benchtop platforms include those that are project-oriented, in which perhaps only 20 plates need to be manipulated, or experiments that need to be performed in a laminar flow cabinet to maximize sterile conditions or minimize hazardous material contact. The ability to perform these types of experiments directly in the lab considerably improves the efficiency of any research lab.

High-efficiency manual systems improve workflow

Automated liquid handling platforms, given the complexity of the operations they can perform, are computer controlled, enabling the user to store many separate methods that can be recalled and started easily. The difficulty with this process is often with the up-front programming and method development that requires a skilled technician to set *x*-*y* positions and robotic head heights (*z* positions) so that the robotic head can go to the right places in the right sequence and perform the programmed actions at the correct height.

All of this up-front energy is recouped when high-throughput experiments requiring the processing of large numbers of plates are performed on a regular basis. If only 20 plates are processed on an irregular basis, high-throughput systems do not provide a good return on investment. A manual system for processing 5–20 plates is a more

Figure 1 | Liquidator 96 manual benchtop pipetting system.

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economical choice, resulting in a more rapid payback on investment yet still meeting the workflow needs of the lab.

For high-speed operational requirements, manual systems can often outperform a robotic platform because the user controls the speed of *x*, *y* and *z* movement as well as the aspiration and dispensing flow rates. Using the Liquidator 96 from Rainin, a novice operator unfamiliar with the system can fill ten 96-well plates accurately and reproducibly with 100 µl/well of solution from a single reservoir, using the same tips, in less than 4 minutes, which is equivalent to 20 seconds per plate. Liquidator 96 not only offers this speed and accuracy, but does so in a benchtop device (only 15-inch width × 13-inch depth × 16-inch height) that provides immediate access for any researcher, without the need for programming or even power. With this compact design, the Liquidator 96 can easily be placed in a sterile environment such as a laminar flow cabinet to accommodate higher-throughput applications that must be contained.

Many applications can now be considered operationally feasible with the new Liquidator 96, providing greater flexibility to every lab and enabling a broader variety of throughput strategies that were not possible before. All aspects of genomic, proteomic and glycomic research can now take advantage of the flexibility of the Liquidator 96 in a diverse range of applications (for an example, see ref. 1).

Simple manual pipettor for immediate use

Liquidator 96 has been developed to occupy minimal benchtop space yet provide sufficient hardware to enable successful medium- to high-throughput workflows. The base of the unit houses two sliding plate holders that move along the *y* axis, each of which can hold two 96-well plates; typically one position is used to hold a box of 96 Liquidator LTS tips. Above these holders is a gantry that allows a pipetting head assembly to smoothly move along the *x* axis and be positioned directly over either of the two holders. Attached to the head assembly is a 96-well liquid head that can move down along the *z* axis, closer to the holders. Attached to the liquid head is a micrometer to set the precise volume required for each tip, an aspirate/dispense lever to move samples in and out of the tips and, finally, a load/disengage mechanism to attach and eject tips. The forces required to load and eject the patented Liquidator LTS tips are extremely low and do not place any burden on the researcher who has to use the instrument all day. The Liquidator has an operating mechanism similar to all pipettes, with a home position, a first stop and blow-out to remove the remaining sample volume in the tip.

This simple set of mechanical components and linkages provides for a robust and precise yet simple system to transfer liquids from mother to daughter plates without the need to program positions, and it is under the control of the user at all times.

Liquidator 96 has been used by several laboratories for medium- to high-throughput applications that traditionally have relied upon automated platforms to fill plates and transfer liquids from one plate to another. In these cases, the Liquidator has provided an efficient alternative that has improved the workflow in these laboratories owing to the immediate access and simplicity of use.

1. Zhu, Z. *et al.* Directed evolution of glucose oxidase from Aspergillus niger for ferrocenemethanol-mediated electron transfer. *Biotechnol. J.* **2**, 241–248 (2007).