by Brian Archibald

Evolving Products in the Homogenizing Field

As technology moves forward in laboratory research and development, new products are emerging within the field of sample preparation. One of the continuously evolving product lines is homogenizing equipment. As technology advances, the industry will rely on novel developments within this field. Some of these developments, offered by **PRO Scientific** (Oxford, CT), are described below.

Dual processing system

The DPS-20 dual processing system (*Figure 1*) combines mechanical and ultrasonic homogenizing methods in a closed compact and timesaving unit with full automation. The system permits the use of each homogenizing method, dependently or independently of each other. It has the memory capacity to store up to nine programs at one time; alternatively, the system can be used in manual mode for individual sample processing. Users are given maximum control to best support their own processing needs.

Figure 1 DPS-20 dual processing system.

The system can be operated in three different configurations: automated mechanical homogenizing, automated ultrasonic homogenizing, and dual homogenizing. Combining both homogenizing methods in the dual homogenizing mode leads to the most effective processing. With mechanical homogenizing, the benefits can be seen in faster sample breakdown of all samples without introducing heat, and limited noise levels. However, mechanical breakdown is limited as to how small the particles can be broken down. Ultrasonic homogenizing offers the advantage of greater particle reduction levels, but the disadvantages can include introduction of heat into the sample, limited use of sample types and volumes, and elevated noise levels. By beginning basic breakdown mechanically and then following up with final breakdown ultrasonically, the DPS-20 system results in faster, more efficient sample breakdown with minimal or no heat introduced, while in a sound enclosure for noise reduction. Automation of the system, coupled with its capability for easy repeat processing, allow for consistent results, thus reducing the amount of hands-on work needed, and freeing up the end user's valuable time in the laboratory.

A high-performance brushless motor provides power for the mechanical homogenizing, while the 130-W processor delivers constant amplitude throughout the ultrasonic processing. End users can safely keep an eye on their samples with the sound-abating enclosure, which has mounted light-emitting diode (LED) interior lighting and a clear polycarbonate door for a full view inside. Included is a removable drip tray for easy cleaning.

The DPS-20 system can be used with 15-, 16-, 19-, and 50-mL tubes through its carousel rack design. It can process up to 20 samples in one run or, when cross-contamination between samples is a concern, it can include rinse cycles of 2 or 10 within designated positions (allows processing of 18 or 10 samples). Laboratory productivity significantly increases when a typical run time for 20 samples is automated in less than 15 min.

Figure 2 Multi-Gen 7 generator probe.

Generator probes

Viewed as the better alternative to plastic generator probes, which are often seen as disposable, the Multi-Gen 7 (*Figure 2*) is a 7-mm-diam generator probe designed to meet the ever-increasing demand to homogenize numerous samples without the risk of cross-contamination, and it eliminates the need to spend valuable time cleaning the generator between samples. The probes are designed to quickly lock into any of the manufacturer's homogenizer units through the Multi-Gen Adapter. The

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Figure 3 *D-Series digital benchtop homogenizer.*

adapter permits hands-free ejection of the used generator probe, which minimizes the chance of accidental contamination when attaching the next generator probe.

The Multi-Gen 7 generator probe is constructed from 316 stainless steel and PTFE. This design offers several important advantages over plastic generator probes, i.e., it can process more samples. With the Multi-Gen 7, difficult samples such as tough tissues, viscous materials, and a greater array of chemicals buffer/medium may be used. The generator probes are supplied in a package of 12 or 24. This allows end users to easily process all of their samples before having to worry about cleaning the generator probe.

With a plastic generator probe, autoclaving can only be done approximately seven times, and therefore each may be used only eight times, whereas the life of a Multi-Gen generator probe is almost unlimited. A Multi-Gen 7 generator probe was tested by running continuously for 11 hr. At the end of the 11-hr period, when the generator probe was taken apart and inspected, there were no signs of wear. Consisting of only a few components, each Multi-Gen generator probe takes only seconds to disassemble and reassemble for cleaning purposes. The probe can be sterilized using any method, including flaming and autoclaving. Because of its high-quality construction, the probe can be reused an unlimited number of times, making it more economical than a plastic generator probe.

Mechanical benchtop homogenizers

Responding to the needs for mechanical homogenizers that can accurately and repetitively perform batch processing, two lines of high-quality benchtop homogenizers, the D-Series and PC-Series, were developed. The slim profile of both homogenizer lines provides a more modern visual appeal, while their technological abilities are equally impressive. Each line consists of four units under the model type PRO300, PRO350, PRO400, and PRO400EL (with a convenient extra-long stand). Both series include the PRO TRAC motorized stand, which enables effortless, accurate, and smooth motor positioning. With sample volume range capability from 0.03 mL to 30 L, the homogenizers are well suited for homogenizing, emulsifying, blending, and/or mixing organic and inorganic materials.

The D-Series (*Figure 3*), a combination of a high-watt motor and advanced technology in digital speed controls, is a very reliable and durable laboratory benchtop unit. The system's Turn Speed Knob can adjust rpm in the hundreds opposed to thousands and features a brighter LED display. The Dual-Power Light Indicator assists with simpler error/problem identification for technical service purposes.

The PC-Series allows for repetitive batch processing with minimal operator attention due to the computer interface. It uses the same technology and structure design of the D-Series, but incorporates a higher level of control. The homogenizer can be used in a manual or program mode through its interface touchpad or a computer. An infinite number of programs can be created and stored, each consisting of up to 23 unique cycles defining speed, run time, and pause between each cycle. At any point the homogenizer can be overridden and manual control can be resumed. PC-Series benchtop homogenizers meet industry requirements for verification of processing and documentation maintenance. As homogenization proceeds, data can be graphed on the computer screen. The programs and the data collected (set time and set speed versus actual time and actual speed) can be stored and recalled for screen display or printout. The PC-Series homogenizers have the ability to store, recall, and repeat.

Homogenization of biohazardous materials

There is currently an increasing demand to safely homogenize biohazardous materials. Safety Seal tubes and chamber assemblies were designed to provide a two-way barrier to keep both the end user and the sample safe. The assemblies protect end users from hazardous aerosols that are generated during processing. Delicate or precious samples are also carefully isolated from external contaminants. The assemblies prevent the user from operating the blade system while the blade is exposed, thus providing an additional level of safety; the tube or chamber must be assembled correctly for the generator or blade to run. The assemblies are available in tube, glass, or stainless steel, ranging from volumes of 1.5 mL to 1 L. All the assemblies work with the manufacturer's homogenizers, from handheld to benchtop models. Safety Seal tubes and chamber assemblies are an extremely safe method of homogenizing, with either a blade for large, solid material sample processing or a rotor stator generator probe for smaller solid material or liquid processing.

Conclusion

R&D is constantly evolving and moving toward quicker and more efficient processing that can be replicated again and again. The homogenizing product lines described in this article—the DPS-20 dual processing system, Multi-Gen 7 system, D-Series and PC-Series benchtop homogenizers, and Safety Seal tube and chamber assemblies, are significant advances in the field of sample preparation.

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