Excerpted from Pharmaceutical Formulation & Quality magazine, Oct/Nov 2002 issue

Laboratory **ANALYSIS**

BY FRANK BATH

A conforming sieve.

Put the Squeeze On

Sieving gets particles down to size for ideal sample prep.

SAMPLE PREPARATION IS NOT AN exact science; laboratory sub-sampling and sample splitting are prone to errors. These errors are due to heterogeneity either in the composition of the material, or in the non-random particle size distribution, which usually occurs as a result of gravitational forces. Any samples used for analytical testing must accurately reflect the composition of the original bulk material. If the initial particle size of the bulk material is too large, obtaining a representative sample is virtually impossible. In these cases, the particle size of the material must be reduced through methods such as grinding and milling. Since particle size plays a central role in this process, an accurate knowledge of the particle size distribution is vital to ensure that sampling requirements, and subsequent product quality, can be met.

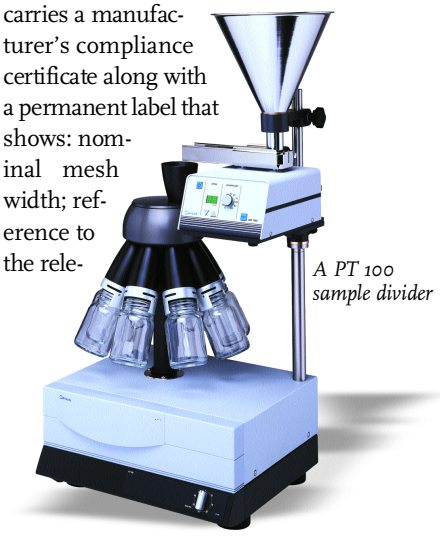
Sieving is cost effective for particle sizes greater than 75µ, although the technique can be used for some materials of smaller size if the method can be validated. Assuming the relevant standards and clean, well-maintained equipment that conforms to the standards are used, sieving can provide an accurate and reproducible measure of particle size distribution within a sample.

A QUALITY SIEVE PROGRAM

The following elements are essential to perform accurate sieving.

Representative partial sample A partial sample used for testing must accurately represent the total mass of material under evaluation. The most effective way to take a representative sample is to install a fully automatic sampler at the appropriate location. If this is not possible, a sample divider or riffler (a sample divider) may be used to divide a large mass of the material into test-sized samples.

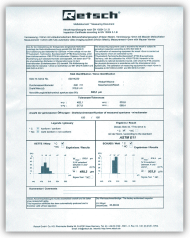
Test sieves that conform to the relevant standards The sieves lie at the heart of the technique and great care must be taken to ensure that they are of correct design and manufactured under clean, controlled conditions, as described in ISO 3310 parts 1, 2 and 3. Each sieve that meets the standard carries a manufacturer's compliance certificate along with a permanent label that shows: nominal mesh width; reference to the relevant standard; material of both sieve and frame; and manufacturer's identification with part number and serial number.



A PT 100 sample divider

The sieve frame should have a smooth surface and stack easily with other sieves. The mesh must be attached to the frame in a way that will not trap any sample material.

Depending on requirements, new test sieves can be purchased with the basic certificate-of-compliance or a detailed inspection certificate. Both certificates ensure that the new sieves comply.



Typical inspection certificate.

But what happens as the sieves get older and are subjected to the rigors of use and cleaning? One method of verifying sieve performance is to periodically check the sieving results with a known sample, under exactly the same conditions, using the results from when the sieves were brand new, as a control. If the results fall outside the acceptable range, recalibration is an option. However, should they fail to meet the required specification, the solution is to replace the sieves.

Reliable sieve shaker and analytical balance Sieve shakers have undergone major design changes to reduce overly noise. Maintenance-free models with electromagnetic drives are extremely quiet and can be used without sound enclosures. USP recommends these models as an alternative to traditional shake-and-tap sieve shakers.

Certain electromagnetic sieve shakers take advantage of the precise and constant frequency of the power supply in the US (60Hz) and through self-amplification of

the resonance, amplitudes up to 3mm can be achieved. USP, however, recommends a amplitudes are maintained between 1 and 2mm. An advantage of electromagnetic design is that, for a given period of time, constant force will be applied to the particles, independent of the number of sieves which can affect the frequency of other electromagnetic sieve shakers. This allows for precise reproducibility, vital to comparing results from different sieve analyzers either within one location, from plant to plant or even from country to country.

Precise timing is critical for precise sieve analysis, particularly with short sieving times, so the sieve shaker must incorporate a digital timer in its design.

To remain in compliance, periodically return sieve shakers to the manufacturer for recalibration. Check with potential suppliers to make sure that this service is offered.

Another consideration in selecting sieve shakers is the balance, which should have a range up to 5,000g, accuracy between 0.01 and 0.1g, and accommodate a 200mm or eight-inch sieve.

Error-free evaluation and documentation After sieving and weighing, the particle size distribution can be calculated and presented in both graphical and tabular formats. This can be performed manually, which is both error prone and time consuming, or by using a commercially available software package. To take full advantage of the capabilities of the software program, both the balance and sieve shaker should interface directly to the computer.

Cleaning and care of equipment and particularly sieves Test sieves, high-precision testing instruments, are treated no better than second-rate cooking utensils in many laboratories. Careful maintenance and cleaning of sieves help maintain the quality of results and prolong the life of these products.

Briefly immerse new sieves in a mild solvent bath to remove oily residues. During routine cleaning, take care to avoid damaging the sieve material and sieves with mesh sizes less than 500µ. Clean them in an ultrasonic bath using water and a mild detergent for three to five minutes. Mesh sizes larger than 500µ can be cleaned with a soft brush followed by ultrasonic cleaning. After cleaning, sieves should be rinsed thoroughly and left to dry in an upright position.

Frank Bath is product manager at Retsch. Contact him at 866-473-8724. ■

Retsch
Newtown, PA
866-473-8724
www.retsch-us.com