Consistency measurement of ointments and similar types of products in the pharmaceutical and cosmetic industry using the Penetrometer PNR 12

One of the leading measurement methods used for quality monitoring in the pharmaceutical industry is consistency measurement by means of a penetrometer. Using this method, involving small sample quantities and short analysis times, precise statements can be made as to the quality of the measurement sample. Subsequent decisions can thus be made quickly and appropriate actions can be implemented.

Figure 1 Penetrometer PNR 12 with Pharma Test Set

It is characteristic for a penetrometer that a penetrator vertically pierces the sample in a freefall for a certain interval with a precisely-defined weight. The resulting penetration depth is a measurement for the consistency of the substance.

Ointments with a low consistency, for example, can be more thoroughly applied on the skin and more easily absorbed. On the other hand, a substance with a high consistency can be used to cover a wound effectively.

The method according to the European Pharmacopoeia 2.9.9. allows consistency measurements with a standard cone or a micro-cone.

Figure 2 Micro-Cone Test Set

In general, the measurement with the micro-cone is preferred based on the following advantages:

- Very small sample volume of 4 mL. This results in short temperature-stabilization intervals. Ideal in case of a limited sample volume in the development phase of new products.
- Broad range of application, from viscous liquids to hard pastes.
- Thanks to the separated sample cup, is easy to fill without air bubbles.

How precise are these measurement devices, and how suitable are they for high-precision measurements? How can new devices be qualified for sophisticated measurements in the pharmaceutical industry, and to what extent are the necessary steps supported and shaped by the device manufacturer?

Product Information

PNR 12 – Pharma and Cosmetic Industry

Use of the measuring devices from Day One: Anton Paar supports the qualification of devices for the pharmaceutical industry!

Whether it involves the testing of raw materials, intermediates or final products, complete quality supervision and precise traceability of measurements are of utmost importance, especially for pharmaceutical products. Therefore a strong and reliable partnership between pharmaceutical companies and the manufacturer of measurement devices is indispensable. This partnership, successfully achieved with devices of the Anton Paar group, is additionally supported in the form of a tailored qualification documentation (PQP-S, Pharma Qualification Package – Smart PNR 12), based on the so-called "6Q" model.

The "2Q" and "6Q" Model

Whereas the "2Q" model tests and documents the installation qualification IQ and operational qualification OQ of a newly-implemented device, the "6Q" model of the Pharma Qualification Package – Smart PNR 12, with the additional Qualification Instruction, the Design Qualification DQ, the Performance Qualification PQ and the Final Qualification FQ, represents the entire qualification required in the pharmaceutical industry.

QI – Qualification Instruction

The Qualification Instruction describes the complete procedure of every single qualification step in detail. Further involved personal and qualified accessories will be specified and documented.

DQ – Design Qualification

The Design Qualification of the Pharma Qualification Package – Smart PNR 12 comprises a qualification timeline and a risk analysis.

IQ – Installation Qualification

Based on precisely-defined tests, Installation Qualification ensures that the delivery and installation conform to the requirements of the supplier. It is the basis for reliable operation.

OQ – Operational Qualification

Operational Qualification guarantees that the device fulfills the required specifications.

It comprises the following testpoints:

- ✓ Calibration
- ✓ Adjustment
- ✓ Measurement of standards
- ✓ Operator training as well as a user SOP (standard operating procedure)

PQ – Performance Qualification

Performance Qualification ensures that the device performs impeccably under routine conditions within the defined specifications.

FQ – Final Qualification

The Final Qualification of the Pharma Qualification Package – Smart PNR 12 comprises a deviation list and the final report summarizing the qualification of this instrument.

Product Information

PNR 12 – Pharma and Cosmetic Industry

The Anton Paar "Pharma Qualification Package – Smart PNR 12"

As would be expected, qualification of a measuring device for the pharmaceutical industry involves a large time commitment, in combination with competent manpower, and thus represents a significant cost factor. Anton Paar has developed a "Pharma Qualification Package" for initial- and re-qualifications, thus offering optimal assistance towards achieving and maintaining the qualification status of the devices.

The Pharma Qualification Package – Smart PNR 12 fulfills the relevant pharmaceutical regulations Good Manufacturing Practice (GMP), Good Automated Manufacturing Practice (GAMP 5), and USP <1058>, and can be used to perform the qualification process in a significantly shorter time, yet at an equivalent level of diligence. This enables savings of valuable resources, above all time and money, during the implementation process. This "Pharma Qualification Package" represents the proper and recognized methodology for qualification of a device for use in the pharmaceutical industry.

Diligent quality monitoring, from raw materials, through intermediates, right down to the final product

Pharmaceutical companies uphold a very high level of responsibility towards their patients. This explains the high standards that pharmaceutical companies place on their products with respect to quality and product safety. Quality and product safety are monitored with a suitable inventory of equipment, sometimes running 24/7.

Not only finished products are constantly tested for quality. Measurements are also made at the time raw materials arrive, as well as during production routines, whereby considerable time pressure builds up, as further processing of the product is often dependent upon the result of the test measurement. This means that the measurement must be not only extremely reliable but must also be completed quickly, and wherever necessary, using small sample volumes, as the samples are often expensive and only available in small quantities.

With these challenges, consistency measurement using the micro-cone method has proved to be extremely effective. With this simple rheological method, all requirements are fulfilled in one system: quickly, precisely and reliably.

In addition to inspection measurements of incoming goods and finished product declarations, knowledge concerning the consistency of a substance for many handling processes such as:

- Kneading
- Pumping
- Pressing
- Mixing
- Filling
- Spraying
- Spreading

is extremely important. The energy balance of these processes is significantly determined by the optimization of the consistency parameters.

It becomes an all-too-familiar challenge when the quality inspection of incoming raw materials in the warehouse is to be made immediately on-site. Raw materials, also in liquid form, are to be tested right away upon delivery, and production lines are examined in terms of their proper operational readiness. Due to the simplicity of the method and the easy operation of the penetrometer, the measurement can also be performed outside an analytical laboratory. The transportation of samples into the laboratory will not be necessary any longer. No specially trained experts are required to carrying out the measurements, since supported by the intuitive menu navigation the routine will be learned very quickly. 16 different programs can be run independently by the user (if desired, also password-protected).

Due to its superb reproducibility of < 3 %, the PNR 12 is also the ideal companion in quality monitoring, from raw materials, right down to the finished product. The threshold indication sounds an alarm when certain predetermined tolerances are exceeded. For a test series of up to 200 values, an integrated statistics function enables the calculation of the standard deviation, mean value, as well as max. and min. values. Connectivity to a LIMS system opens up all the opportunities of modern laboratory data management. As an alternative, the data can also be very easily read out using a USB stick.

Future-proof

In close collaboration between pharmaceutical companies and the measurement device manufacturer, it was possible, using the combination of the penetrometer PNR 12 with the "Pharma Qualification Package – Smart PNR 12", to create quality monitoring conditions adapted to precise needs, guaranteeing utmost precision with a small sample quantity.