

# *Texture Analysis of Pet Food and Accessories*

Helping to  
keep pets  
and their  
owners  
happy!



# Texture Analysis of Pet Food and Accessories

Jo Smewing, business development director at Stable Micro Systems, looks at texture analysis applications in this popular and buoyant product sector.

## MAKING THE MOST OF A VAST AND GROWING MARKET

Four out of five pet owners consider their pet a member of the family and with 79% saying the quality of their pet's food is as important as their own, it is not surprising that the premium sector accounts for 40% of the \$26 billion US pet food market. Globally the pet care products market is worth almost \$100 billion.

### *Pet Accessories*

Pet owners always want the best for their animals and are willing to spend a lot of money buying brands that make pets more comfortable or give the owner an easier job while looking after them. There are many quality control procedures that can be used to assess the quality of pet accessories.

When buying a new dog lead, you may see that many brands are now including a tensile strength rating on the packaging. Some dogs love to pull as hard as possible, and this can be bad news if a strong dog sees a squirrel running up a tree and goes for the chase.

Using suitable *Tensile Grips* [A], the TA.HDplus Texture Analyser can give an accurate value for this strength rating.

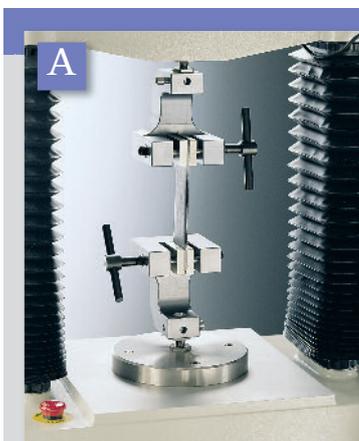
As well as the lead itself, the junction between the collar and lead can be a weak spot, as can the sewn over ends of the lead. All these weak spots can be identified by the use of a tensile test on different sections. With a maximum force rating of 750kg and easy to use software, the TA.HDplus is ideal for this type of test.

Similarly, many owners look for dog chew toys that will last more than a day or two. The range of Texture Analysers by Stable Micro Systems can be equipped with a sharp steel cone probe; a puncture test using the *Cone Probe* [B] can be useful for assessing hardness and toughness. A hard material will require a high force to break through the surface. Once the toy has been punctured by a sharp tooth, a good quality material should be prevented from fracturing by increased toughness. This can be measured by calculating the energy required to completely break through the material with the cone, which is represented by the area under the force-distance curve.

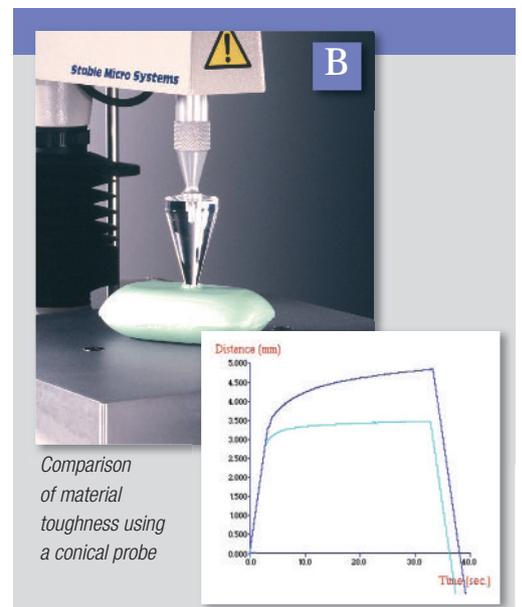
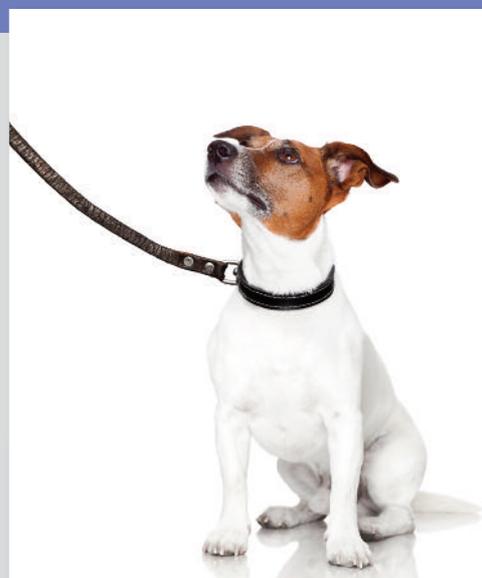


The Stable Micro Systems TA.HDplus Texture Analyser

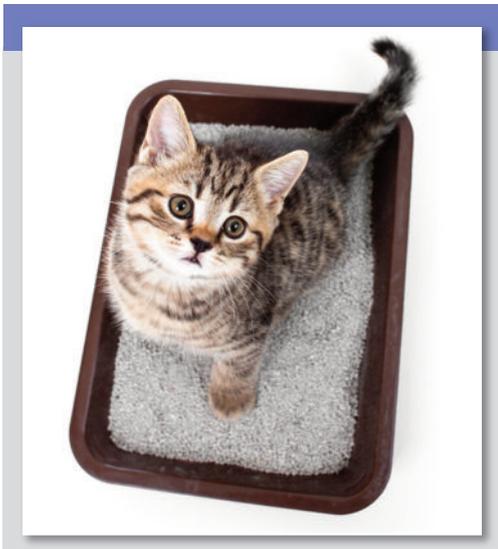
*“Pet owners always want the best for their animals...”*



Typical tensile test on synthetic material using the TA.HDplus Texture Analyser



Comparison of material toughness using a conical probe



Dog owners are not the only group who will benefit from monitoring the mechanical properties of accessories. Before the 1940s, cat litter was usually made up of sand, wood shavings or old newspapers until an absorbent type of clay was invented that helped improve the smell and associated hygiene.

Following this, clumping cat litter was developed in the 1980s, locking in bad odours and enabling soiled litter to be scooped out once a day, leaving the rest of the litter clean and ready to be topped out. Many consumers still prefer clumping litter as it enables the tray to be renewed much less frequently, proving to be more economical and less wasteful.

The TA.XTplus Texture Analyser is very useful for testing cohesiveness of clumps formed by the addition of moisture. A good clump is one that can be removed from the tray intact (high cohesiveness) and a bad clump is one that disintegrates upon removal (low cohesiveness).

To test this property, a compression test can be used to look at the force required to fracture the clump, and the type of fracture ascertained by looking at the force-time graph. In addition, the dry granules can be tested under compression using a *Granule Compaction Rig* [C]. This has the advantage of assessing how the attrition of the litter during transit.

Many other pet accessories will benefit from this type of mechanical assessment and quality

control, and brands will benefit from real scientific evidence that quantifies why their product should be chosen above all others. Tests are generally quick and easy, and methods and equipment can be customised to suit almost every application need.

### *Dry Pet Food*

There are obvious differences between the processes of quality control in the human and pet food industries, the main one being the lack of feedback from the pet sensory panel. However, quick rejection of undesirable food provides enough motivation for pet owners and pet food manufacturers alike to provide animals with the correct food.

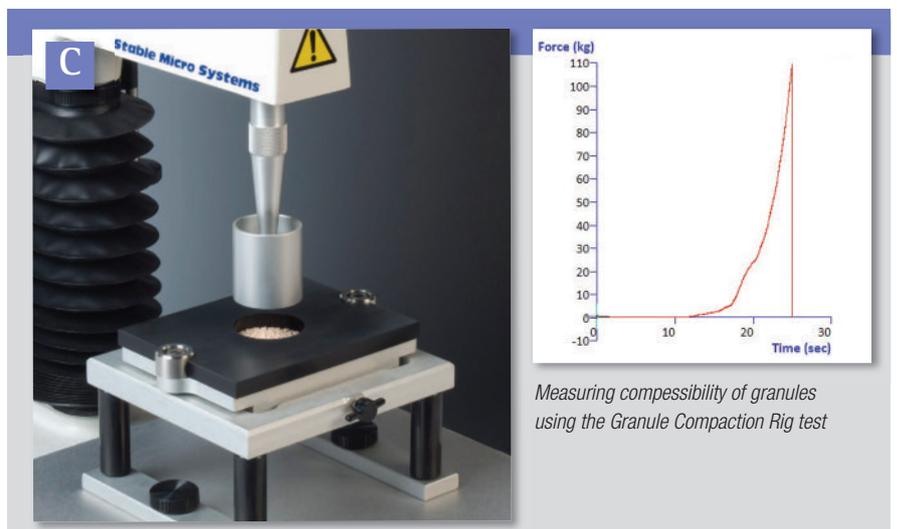
In the pet industry, some aspects of the food must also appeal to the owner feeding the animal – the smell, appearance and texture must all be pleasant and not off-putting. These are all important to the animal eating the food too, and taste must also be desirable. As well as this, all food meant for animal consumption has imposed safety and nutritional targets. These put a limit to the number of options available when putting together the formulation process.

After determining the parameters necessary for a high quality product, it is usual to use texture analysis techniques to determine the measurable properties. Stable Micro Systems offer many different testing options.

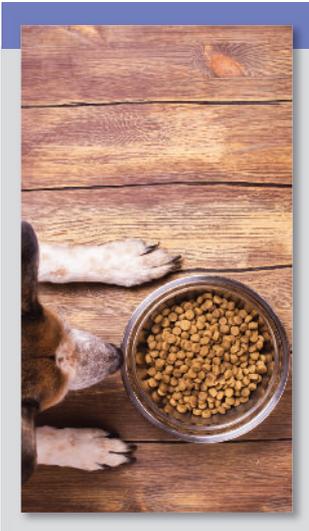


The Stable Micro Systems TA.XTplus Texture Analyser

*“Many other pet accessories will benefit from this type of mechanical assessment...”*



# Texture Analysis of Pet Food and Accessories



*“... texture analysis must be performed at every stage.”*

Dry pet food makes up a large share of the pet care market, and manufacturers are keeping up with this trend by sinking more of their R&D budget into quality control and physical testing. For a manufacturer to turn a profit, safe products that pet owners want to buy must be made and sold at a price they are willing to pay. Pet food production must be cost-effective, sustainable, meet food safety requirements and produce appetising, nutritious products for owners to feed their pets.

High levels of physical quality are important down through the whole supply chain – manufacturer, retailer, pet owner and pet all benefit from careful texture analysis. Texture analysis is important for process control, quality control and product development as well as process efficiency (reducing extruder power consumption).

Texture is influenced by several parameters including ingredients, processing methods, packaging and storage conditions. After extrusion, kibbles are dried, coated and cooled before being packed. The conveying process can be long and the kibbles are subject to constant stress that weakens them, resulting in dust and breakage.

Consequently, the durability and hardness of pellets are considered to be the most important factors that are measured during quality control before distribution. Durability is the ability to handle the final product without unacceptable breakage, which produces dust particles that are not eaten by the animal.

The composition of raw materials and their quality and processing all affect physical pellet quality, as does the manufacturing technique. It is important to understand all of the factors that influence the physical quality of pet food in order to consistently achieve the best final product quality possible.

Instrumental texture analysis is a fast, accurate and repeatable method for assessing (and perfecting) kibble quality, and many of the necessary measurements can be performed

using the TA.XT*plus* Texture Analyser by Stable Micro Systems.

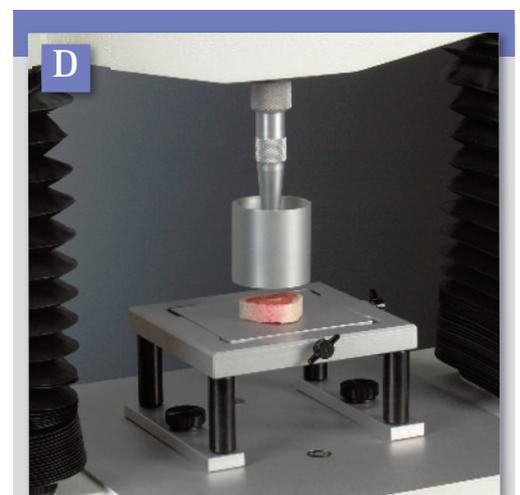
## *Individual Pellets*

Kibble hardness, elasticity, chewability and crunchiness, and the stickiness of moist kibble all affect palatability when given to the pet. If the food is rejected, the owner will automatically be pushed to go out and find a new brand. Preconditioning and extrusion affect key parameters including strength, density and cooking method.

Density control, kibble texture and the cooking process are important as these can affect digestibility and cause diarrhoea in pets (a factor that will certainly cause owners to look towards other brands).

The durability of pellets is influenced by the percentage of nutrients in the materials and their interaction within the structure of the pellet. If a change is made to the nutrients (for example, to become gluten free), the manufacturing technology and the compaction forces that create the network between nutrients will need to be adjusted to keep the physical properties consistent, and texture analysis must be performed at every stage.

The hardness of the pellets also affects their appearance and storage properties. Analysing pellet hardness allows the understanding of the forces necessary to break the pellet after



*Cylinder probe compression test on typical dog treat*

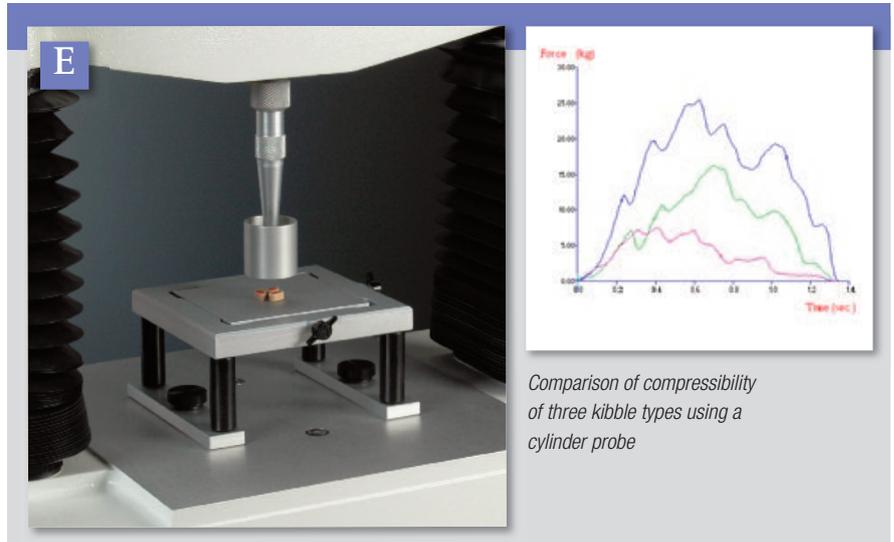
manufacturing and helps to decide the ingredients and processes that should be used during manufacturing. Hardness analysis can be performed on individual pellet samples by compressing them using a flat probe, recording the forces needed to break the pellets.

More useful results for oddly-shaped kibble can be achieved by performing a test of four or five samples with a compression platen, which creates an averaging effect. Stable Micro Systems provide a range of *Cylindrical Test Platens* [D/E]. When these are used along with *Exponent* software, an easy, automated testing procedure can be developed that saves product data in batches, with all date, time, sample weight and dimension, and instrumental data at hand.

Although compression tests give a clear graphical indication of kibble hardness, many manufacturers are supplementing this data with audio and video recordings of the test using the Stable Micro Systems *Acoustic Envelope Detector* [F] and *Video Capture and Synchronisation System* [G].

This information can be synchronised with the force data and played back frame by frame to observe and hear the fracturing of the pellets, which happens too quickly to be understood by the human eye.

Waste is a very important parameter to reduce. It is expensive and generates customer



complaints, and is caused by broken kibble and dust. Bulk compression of a large number of pellets in a *Kramer Shear Cell* [H] attached to a TA.HDplus will show how pellets interact when pressed against each other under high stress, such as during storage or transport.

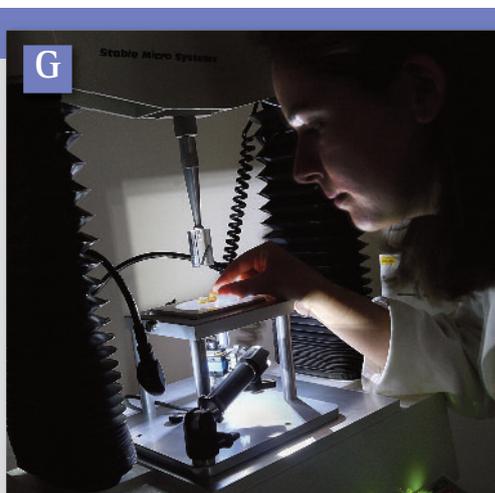
The TA.HDplus can exert forces up to 750kg, which will stand up to even the hardest pellets in bulk and show the force peaks and drops as pellets fracture. Some pellet shapes will withstand higher forces in bulk; spherical pellets are likely to be the strongest as there are no asperities to be broken off.

Additionally, many pet owners pre-soak kibble before feeding their animals. It is easy to get the volume of liquid wrong or to leave it

*“... an easy, automated testing procedure can be developed...”*



Setup of Acoustic Envelope Detector system



Video Capture and Synchronisation System in use



Bulk compression using a Kramer Shear Cell

# Texture Analysis of Pet Food and Accessories

*“Particle size distribution in the powder and granules ... is another key quality parameter...”*



*Ottawa Cell test of pre-soaked product*



*Three Point Bend test of dog biscuit*

soaking for too long. This results in an unattractive mush. The *Ottawa Cell* [J] allows pellets and fluid to be tested in the same secure container, and its use helps manufacturers to define the ideal volume and soaking time to give guidance to their customers.

Petfood snack sticks can also be tested by the use of a *Three Point Bend* test [K]. The stick is positioned on two base supports and load applied from above in the centre of the stick. The force to break indicates the brittleness or flexibility of the stick – such characteristics being of great importance to the acceptability of the product.

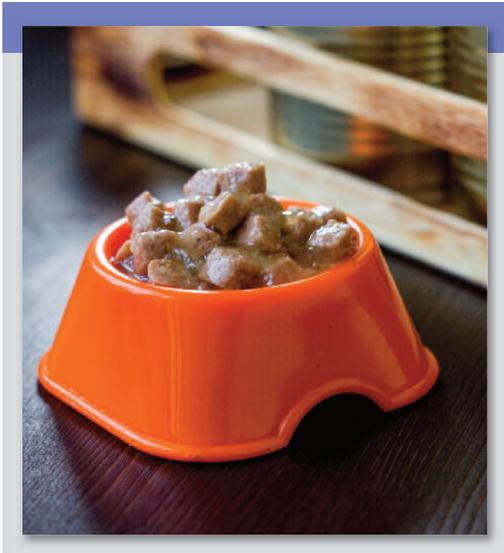
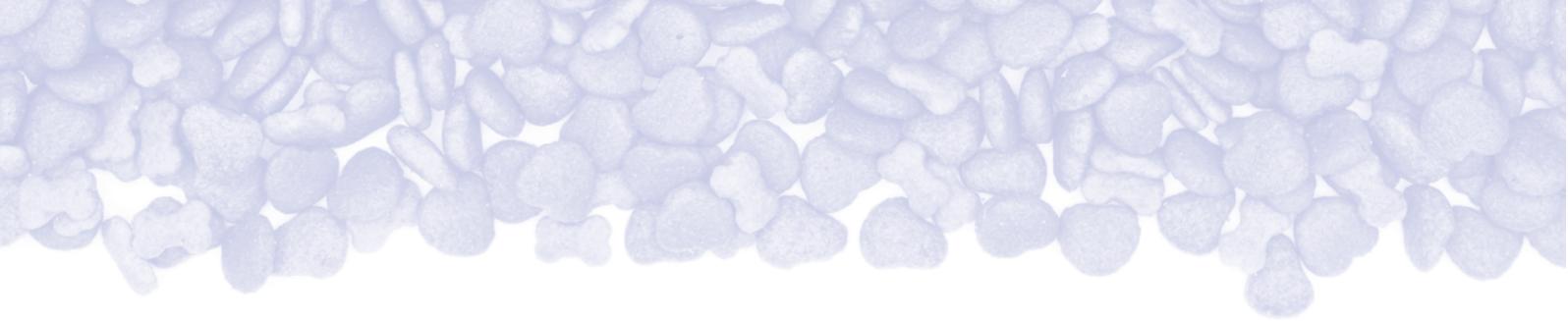
Particle size distribution in the powder and granules used for extrusion is another key

quality parameter, as finely ground materials positively influence kibble appearance and texture. Mixing efficiency and homogeneity is also important, with wide particle size variability causing segregation and separation during pre-extrusion mixing.

This also has a negative impact on the nutritional value of the product, as each kibble should have the same nutritional content. Stable Micro Systems offer a wide range of powder and granule testing solutions. The *Powder Flow Analyser* [L] is perhaps the most valuable in this application, enabling careful automatic analysis of flow, caking, cohesive and bridging properties of powders and granules.



*The Powder Flow Analyser fitted to a TA.XTplus*



## Wet Pet Food

Wet foods make up the majority of products sold in pet shops, consisting of meat and liver with a range of other ingredients. The textures are solid, puréed, shredded, cuts, cubes and blends of human food ingredients. These are much more palatable than dry foods to most cats and dogs – neither dogs nor cats are drawn to sticky foods, but both show a preference for wet food rather than dry. Cats are even fussier than dogs about the texture of their food. The downside is that stools in the litter box are generally softer and smellier if the foods are not formulated correctly,

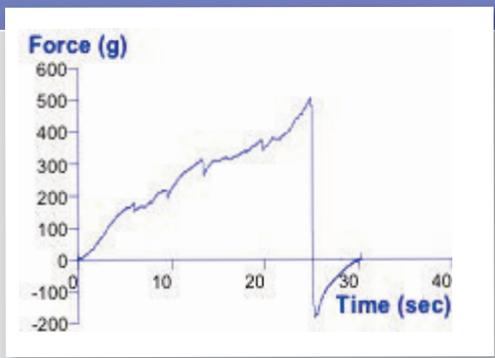
providing more motivation to work on the texture of the food (as well as the nutritional content).

Most wet cat and dog food is packaged in a rigid can or flat square tin, all with lids that are peeled off. A quick and easy test of the food’s firmness is the use of a ball probe pushed into the flat surface by the Texture Analyser. A firmer food will provide more resistance (shown as a higher force) against the probe.

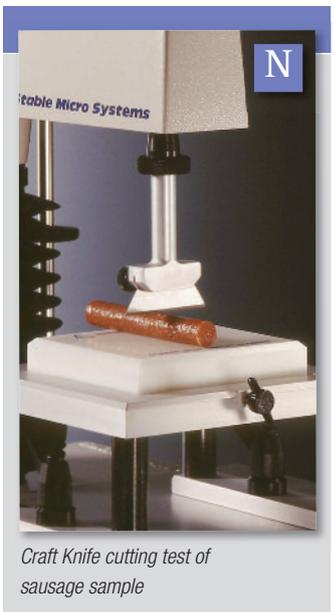
The majority of wet foods contain several different textures held within a jelly or gravy matrix. This presents a textural challenge as a single point penetration test in different areas of the food will give different results. However, Stable Micro Systems offer a *Multiple Puncture Probe* [M] that provides an average of many areas, providing more repeatable results. Probes can be removed for cleaning and can be replaced easily if damage has occurred.

Some dog foods are sold packaged in a sausage shape wrapped in plastic film. These can be tested using the multiple puncture mentioned above (if a flat surface is presented to the probe), or the sample can be cut using a *Craft Knife* [N], giving an assessment of the sample hardness and the energy required to cut through.

*“Cats are even fussier than dogs about the texture of their food...”*

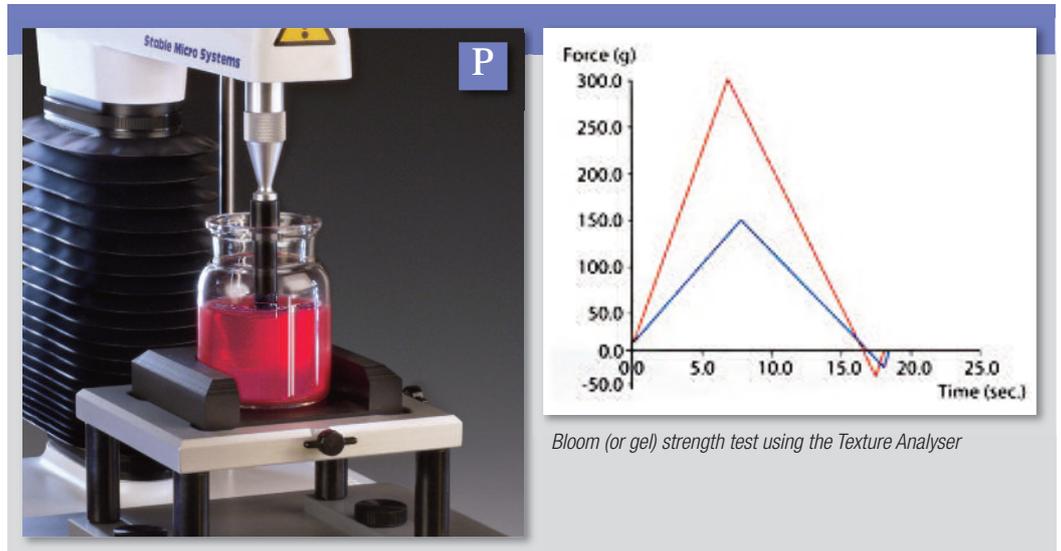


Penetration test on canned dog food using a Multiple Puncture Probe



Craft Knife cutting test of sausage sample

# Texture Analysis of Pet Food and Accessories



Bloom (or gel) strength test using the Texture Analyser

*“... raw pet food is becoming increasingly popular...”*

Before production, many ingredients are tested in isolation to monitor their quality individually. For example, gelatin is widely used in many wet (and dry) pet foods as an easily digested, low calorie ingredient for added protein and elasticity (to control chewiness and firmness). The gelatin *Bloom test* [P] is a standard and is offered by Stable Micro Systems. The test gives gel strength, bloom strength, force to rupture and elasticity data.

Lastly, raw pet food is becoming increasingly popular. It is perceived as healthier alternative to standard pet food, and has been pushed along by the recent trend of raw food in human diets. The above testing techniques are

even more important for raw food analysis. The taste of the food is automatically different so it is crucial to keep the texture as similar as possible to standard food, to prevent rejection.

Don't let yourself get lost in the expansive global pet food market. Update your physical testing procedures with a Texture Analyser and ensure yours is the brand that customers turn to time and again, because they know they are feeding their pet a product of the highest quality.

Contact Stable Micro Systems today to discover the full range of Texture Analysis solutions.

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