

Solutions for
the food industry



Anton Paar

Viscometry &
Rheometry



MASTER THE FLOW

ANTON PAAR OFFERS A COMPREHENSIVE PORTFOLIO OF ROTATIONAL VISCOMETERS AND ROTATIONAL/OSCILLATORY RHEOMETERS TO MEASURE FOOD PRODUCTS AT EACH STEP OF THEIR LIFE CYCLE.

WITH THE RIGHT INSTRUMENTS YOU CAN BE SURE THAT YOU:

Only work with ideal ingredients after a quality check of incoming raw materials

Adapt the ingredients of your food product in a way that leads to the best possible taste, appearance, and mouthfeel

Have a smooth transportation process between the different stations as well as filling and packaging

Use the right packaging materials to keep your product fresh and safe



SUPPLIER DELIVERING

1 The first step in the production chain of food products is the delivery of goods. As the quality of the raw materials also defines the quality of the end product, it is very important to ensure that your suppliers meet your quality control criteria for incoming goods.

PRODUCTION

2 Large quantities of raw materials are converted into ready-made food products. During this step, full control of the manufacturing and production process is essential. Selecting the right ingredients, adjusting the right concentrations, and choosing the appropriate pre-treatment and temperature are all part of creating high-quality products.

FILLING AND PACKAGING

3 After production, filling and packaging are the next important steps required for further industrial processing (distribution, storage, sale, and use). During this step it is necessary to use the right packaging material for enclosing and protecting your product. Therefore, checking its viscoelastic properties as influenced by material selection, processing conditions, and also environmental conditions are essential activities.

STORAGE

4 In order to make sure to preserve the quality of the produced food you need to be aware of the storage conditions and their effect on your product. The packaging material is also essential in this case. Among other things, food safety, customer satisfaction, food preservation, and reduction of food waste need to be ensured. Testing the sedimentation and demixing behavior of the ingredients (also called shelf life), for example, ensures your product's long-term quality.

APPLICATION

5 The last step in the production chain is the consumption of your product by the customer. The rheological properties of your food product directly translate into measurable parameters such as spreadability, pourability, and smooth flowing as well as the customer's sensations such as drinkability or mouthfeel.

The life cycle of food products

The life cycle of food products: Typical tests



1 SUPPLIER DELIVERING RAW MATERIALS

- Single-point dynamic viscosity measurements for quick quality control checks of fruit juice/purees or syrup to test whether they have the right viscosity
- Yield point determination of fruit juice/purees or syrup to estimate the force applied in order to make the raw material flow
- Flow/viscosity curve determination and viscosity determination of the raw material gum arabic solution at different temperatures to control different production stages
- Segregation and wall friction behavior analysis of flour in order to avoid segregation or demixing during the powder mixing process

2 PRODUCTION (MIXING AND FORMULATION)

- Single-point dynamic viscosity determination for quick quality control checks of yogurt/sour cream to ensure the right product viscosity at different production stages
- Flow/viscosity curve and viscosity determination in order to see if a reduction of fat or sugar also changes the texture of a product
- Yield point determination of sauces such as ketchup or mayonnaise in order to assess the force required to get the sauce out of the container
- Oscillatory frequency tests of pudding gel to accurately measure the sample's viscosity without breaking its structure
- Rotational and oscillatory temperature-dependent tests of ice cream in order to find out new formulations that meet the right rheological properties of the product to achieve the expected sensory attributes
- Oscillatory frequency sweeps of gluten-free bread dough to compare the 3D structure created to that of standard bread dough
- Measurement of the viscosity of meat sauce with a ball measuring system to evaluate the flow properties, also of sauce that contains very large particles
- Testing the gelatinization behavior of starch at different elevated temperatures in order to find the pasting temperature and final viscosity of the starch
- Determination of time-dependent structural regeneration to make sure that products like toppings show a good appearance after application

3 FILLING AND PACKAGING

- Determination of the viscoelasticity of packaging films to obtain consistent quality without surface imperfections
- Shear and extensional rheological properties of suitable packing material to ensure a high-quality product with optimum production costs
- Mechanical performance of packaging films under controlled temperature and humidity or in immersion in order to select the suitable materials to properly protect your final food product
- Rheological tests of PET and recyclates to determine the shear rheological and extensional rheological properties of the raw materials in order to produce suitable preforms for beverages with injection molding
- Measurement of the intrinsic viscosity of packaging materials to determine the right PET grade of food and beverage packaging

4 STORAGE

- Evaluation of the rheological properties of salad sauce with an oscillatory frequency sweep in order to make sure that the herbs and spices do not sediment during storage
- Testing the influence of ambient conditions such as temperature or humidity on the rheological properties of the stored sample, for example in the biscuit industry

5 APPLICATION

- Single-point dynamic viscosity checks for quick quality control of clinical nourishment products to ensure the right viscosity for optimum drinkability and smooth mouthfeel
- Viscosity determination of hazelnut cream at different shear rates and temperatures in order to find the perfect mouthfeel
- Determination of the yield stress of jam to obtain a solid behavior and make sure that it does not flow off the spoon or that it is easily spreadable on bread
- 3 interval thixotropy test (3iTT) to study the structure recovery of sauces such as ketchup or mayonnaise and to simulate real application conditions, for example applying the product on hot french fries
- Amplitude sweeps for checking the spreadability of butter, chocolate creams, or jams

The whole world of viscometry and rheometry



	Lovis 2000 M/ME	ViscoQC 100	ViscoQC 300	RheolabQC
Description	Viscosity measurement of low-viscosity liquids for R&D applications and quality control	Single-point dynamic viscosity of low- to high-viscosity liquids for quick quality control	Multi-point dynamic viscosity of low- to high-viscosity for quick quality control	Rotational rheological tests of materials ranging from low-viscosity to semi-solid samples
Toolmaster™*		✓	✓	✓
Magnetic/quick connect coupling**		✓	✓	✓
Common test methods	Single-point viscosity measurements, temperature scans, time scans, zero-shear scan	Single-point viscosity measurement	Flow/viscosity curve Yield point determination Investigation of time- and temperature-dependent behavior	Rotational test for yield/flow point determination Rotational 3 interval thixotropy test (3iTT)
Measurement geometries	Capillaries made of borosilicate glass and PCTFE in various diameters, stainless steel or gold balls	Relative spindles (L/RH), DIN/SSA spindles, vanes	Relative spindles (L/RH), DIN/SSA spindles, vanes	Concentric cylinders and cups, double gap, ball measuring system (BMS), stirrers

	MCR 72	MCR 92	MCR 102e, 302e, 502e	MCR 702e MultiDrive
Description	Rotational rheological tests with cup-and-bob, parallel-plate, and cone-plate measuring systems for liquid to semi-solid samples	Rotational and oscillatory rheological tests with cup-and-bob, parallel-plate, and cone-plate measuring systems – for almost all kinds of samples	Investigations into the viscoelastic properties of raw materials, formulations, and final products from QC to R&D	Complete material characterization in research and development
Toolmaster™*	✓	✓	✓	✓
Magnetic/quick connect coupling**	✓	✓	✓	✓
Common test methods	Rotational test for yield/flow point determination Rotational 3 interval thixotropy test (3iTT)	Amplitude sweep and frequency sweep Oscillatory 3 interval thixotropy test (3iTT)	Rotational and oscillatory measurements of solids Powder rheology	Advanced oscillatory and rotational tests with one or two drive units Full DMA capabilities in torsion, tension, bending, and compression mode
Measurement geometries	Cone-plate, parallel-plate cylindrical geometries	Cone-plate, parallel-plate, cylindrical geometries	Solid fixtures for films, fibers, and bars, fixtures for extensional rheology	Three-point-bending, cantilever

Standard methods: ICA test method 46 for chocolate, ASTM D2196 for measuring non-Newtonian samples, ISO 3219 and DIN 53019 (Part 1) for absolute measuring systems

* for automatic tool recognition and configuration to ensure easy handling and minimize user errors
** for easy one-handed attachment/exchange of spindles, bobs, and measuring systems

VISCOUS LIQUIDS
Water, vegetable oils, honey, fruit juice, syrup

VISCOELASTIC FLUIDS
Dressings, chocolate (during processing), mayonnaise, ketchup

PASTE-LIKE MATERIALS
Processed cheese, cream cheese, yogurt, sour cream, jam

GELS
Pudding, fruit gums

SOFT SOLIDS
Hard cheese

