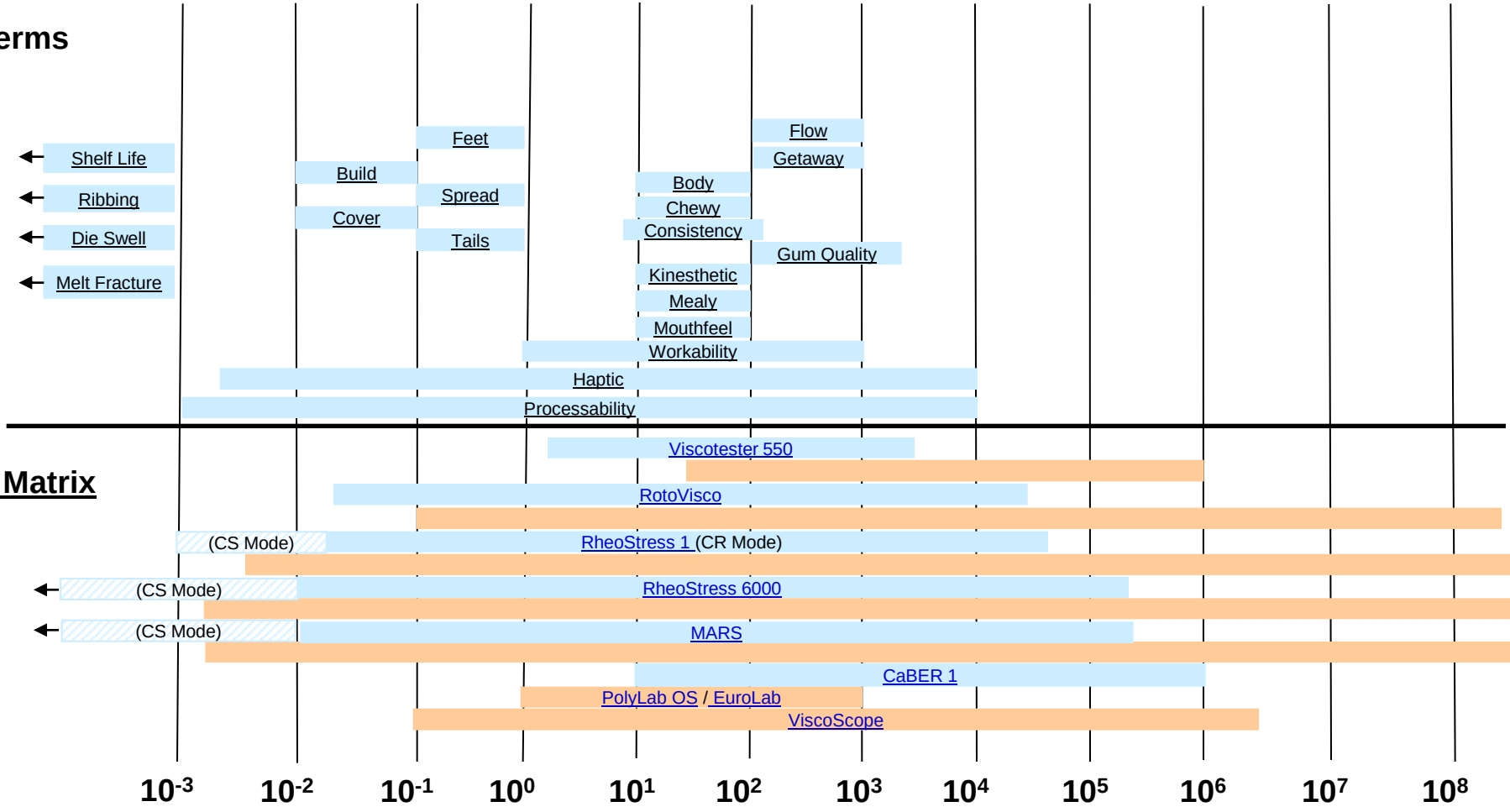
Interactive Food Dictionary

Common Terms



Equipment Matrix

Rheology Solutions

Measurement Range (Shear Rate s^{-1})

Measurement Range (Viscosity mPa.s)

- Viscotester, RotoVisco, RheoStress, MARS, CaBER, EuroLab and PolyLab OS are HAAKE product names of Thermo Scientific Instruments.
- ViscoScope is a brand name of Marimex Industries Corporation.

Website: www.rheologysolutions.com Head Office: +61 3 5367 7477

Copyright : Rheology Solutions Pty Ltd 2011

Industry Term: Body

Process:	Consumption.
Definition:	The quality of a food or beverage, relating variously to its consistency, compactness of texture, fullness, or richness.
Governing Properties:	In a liquid, the impression of body is related to shear viscosity, measured with a flow curve on a Controlled Rate (CR) viscometer, and on viscoelasticity, measured with a frequency sweep on a Controlled Stress (CS) rheometer. Also related to solid mechanical properties of adhesiveness, cohesiveness, hardness, measured according to Szczeniak on a texture analyser.
Rheology Solutions Instrument:	HAAKE Viscotester 550, HAAKE RotoVisco, HAAKE RheoStress, HAAKE MARS.

Rheology Solutions

Return

Copyright: Rheology Solutions Pty Ltd 2011

Industry Term: Build

Process:	Production (Coating).
Definition:	The wet or dry thickness of a coating film.
Governing Properties:	Flow properties in shear dictate the build of a material. Use a CR viscometer to generate flow curves and in particular yield point.
Rheology Solutions Instrument:	HAAKE Viscotester 550, HAAKE RotoVisco.

Rheology Solutions

Return

Copyright: Rheology Solutions Pty Ltd 2011

Industry Term: Chewy

Process:	Consumption.
Definition:	Tending to remain in the mouth without rapidly breaking up or dissolving. Requiring mastication.
Governing Properties:	For liquid foods, the impression of chewyness is dictated by extensional properties, measured on an extensional rheometer, by the viscoelasticity of the material, measured on a CS rheometer using a frequency sweep and on shear flow properties, including yield stress, measured using a CR viscometer. This is also a solid rheological (mechanical) property, related to adhesiveness, which is measured according to Szczeniak on a texture analyser.
Rheology Solutions Instrument:	HAAKE CaBER 1, HAAKE Viscotester 550, HAAKE RotoVisco, HAAKE RheoStress, HAAKE MARS.

Rheology Solutions

Return

Copyright: Rheology Solutions Pty Ltd 2011

Industry Term: Consistency

Process:	Consumption.
Definition:	All the sensations resulting from stimulation of the mechanical receptors and tactile receptors, especially in the region of the mouth, and varying with the texture of the product.
Governing Properties:	For liquid foods, the impression of consistency is dictated by extensional properties, measured on an extensional rheometer, by the viscoelasticity of the material, measured on a CS rheometer using a frequency sweep and on shear flow properties, including yield stress, measured using a CR viscometer. This is also a solid rheological (mechanical) property, related in part to many others, adhesiveness, cohesiveness, brittleness, hardness etc, which are measured according to Szczeniak on a texture analyser.
Rheology Solutions Instrument:	HAAKE CaBER 1, HAAKE Viscotester 550, HAAKE RotoVisco, HAAKE RheoStress, HAAKE MARS.

Rheology Solutions

Return

Copyright: Rheology Solutions Pty Ltd 2011

Industry Term: Cover

Process:	Production (Coating).
Definition:	The amount of a coating at a given point on the substrate.
Governing Properties:	Flow properties in shear dictate the cover of a material. Use a CR viscometer to generate flow curves and in particular yield point. In addition, cover can be enhanced by manipulation of viscoelastic properties, measured on a CS rheometer, using a frequency sweep.
Rheology Solutions Instrument:	HAAKE Viscotester 550, HAAKE RotoVisco, HAAKE RheoStress, HAAKE MARS.

Rheology Solutions

Return

Copyright: Rheology Solutions Pty Ltd 2011

Industry Term: Die Swell

Process:	Production (Extrusion).
Definition:	Die swell occurs when an extrudate has larger diameter than the die. Caused by the release of stresses in the extrudate leaving a contraction – the extrudate 'remembers' it's original shape and attempts to return to it.
Governing Properties:	Die swell is influenced by normal stresses in the system, and by the viscoelastic properties of the melt. It is possible to measure these using a CS rheometer (first normal stress difference and frequency sweep measurements). In addition, die swell is related to the length of the die, a die swell test can be used to directly measure die swell on production- or small-scale extruders.
Rheology Solutions Instrument:	HAAKE RheoStress, HAAKE MARS, HAAKE PolyLab OS & Die Swell Tester

Rheology Solutions

Return

Copyright: Rheology Solutions Pty Ltd 2011

Industry Term: Feet

Process:	Production (Dip Coating).
Definition:	Excess material which has flowed from the coated substrate under the influence of gravity.
Governing Properties:	Flow properties in (low) shear dictate the build of a material. Use a CR viscometer to generate flow curves and yield point.
Rheology Solutions Instrument:	HAAKE Viscotester 550, HAAKE RotoVisco.

Rheology Solutions

Return

Copyright: Rheology Solutions Pty Ltd 2011

Industry Term: Flow

Process:	Production (Pumping/ Mixing).
Definition:	Measure of the ability of a sample to be moved (by gravity or other force).
Governing Properties:	The rate of flow of a liquid is governed by its properties in shear, including the yield point at low shear, measured with a CR viscometer, and by the viscoelastic properties of the liquid, as measured on a frequency sweep by a CS rheometer. CR measurements can often be made in-line.
Rheology Solutions Instrument:	HAAKE Viscotester 550, HAAKE RotoVisco, HAAKE RheoStress, HAAKE MARS, Marimex ViscoScope.

Rheology Solutions

Return

Copyright: Rheology Solutions Pty Ltd 2011

Industry Term: Getaway

Process:	Consumption.
Definition:	A textural property perceived as shortness of duration of mouthfeel.
Governing Properties:	For liquid foods, the impression of getaway is dictated by extensional properties, measured on an extensional rheometer, by the viscoelasticity of the material, measured on a CS rheometer using a frequency sweep and on shear flow properties, including yield stress, measured using a CR viscometer. This is a solid rheological (mechanical) property which is measured according to Szczeniak on a texture analyser. Getaway is related to other textural properties such as adhesiveness, cohesiveness, elastic quality, hardness etc.
Rheology Solutions Instrument:	HAAKE CaBER 1, HAAKE Viscotester 550, HAAKE RotoVisco, HAAKE RheoStress, HAAKE MARS.

Rheology Solutions

Return

Copyright: Rheology Solutions Pty Ltd 2011

Industry Term: Gum Quality

Process:	Consumption.
Definition:	Hardness x Cohesiveness.
Governing Properties:	For liquid foods, the impression of consistency is dictated by extensional properties, measured on an extensional rheometer, by the viscoelasticity of the material, measured on a CS rheometer using a frequency sweep and on shear flow properties, including yield stress, measured using a CR viscometer. Solid property – related to cohesiveness, hardness which may be measured according to the method of Szczeniak on a texture analyser.
Rheology Solutions Instrument:	HAAKE Viscotester 550, HAAKE RotoVisco.

Rheology Solutions

Return

Copyright: Rheology Solutions Pty Ltd 2011

Industry Term: Haptic

Process:	Consumption.
Definition:	Pertaining to the skin or to the sense of touch in its broadest sense.
Governing Properties:	For liquid foods, the impression of skin feel is dictated by extensional properties, measured on an extensional rheometer, by the viscoelasticity of the material, measured on a CS rheometer using a frequency sweep and on shear flow properties, including yield stress, measured using a CR viscometer. Related to solid properties – adhesiveness, cohesiveness, brittleness, hardness etc, which can be measured according to Szczeniak on a texture analyser.
Rheology Solutions Instrument:	HAAKE CaBER 1, HAAKE Viscotester 550, HAAKE RotoVisco, HAAKE RheoStress, HAAKE MARS.

Rheology Solutions

Return

Copyright: Rheology Solutions Pty Ltd 2011

Industry Term: Kinesthetics

Process:	Consumption.
Definition:	The perceived quality that the consumer evaluates through a sense of feel, especially mouthfeel.
Governing Properties:	For liquid foods, the impression of mouthfeel is dictated by extensional properties, measured on an extensional rheometer, by the viscoelasticity of the material, measured on a CS rheometer using a frequency sweep and on shear flow properties, including yield stress, measured using a CR viscometer. Related to solid mechanical properties through adhesiveness, cohesiveness, brittleness, hardness etc, measured according to Szczeniak on a texture analyser.
Rheology Solutions Instrument:	HAAKE CaBER 1, HAAKE Viscotester 550, HAAKE RotoVisco, HAAKE RheoStress, HAAKE MARS.

Rheology Solutions

Return

Copyright: Rheology Solutions Pty Ltd 2011

Industry Term: Mealy

Process:	Consumption.
Definition:	A quality of mouthfeel denoting a textural property manifested by the presence of components of different degrees of firmness or toughness.
Governing Properties:	For liquid foods, the impression of mealyness is dictated by extensional properties, measured on an extensional rheometer, by the viscoelasticity of the material, measured on a CS rheometer using a frequency sweep and on shear flow properties, including yield stress, measured using a CR viscometer. Related to solid mechanical properties of adhesiveness, hardness, measured according to Szczeniak on a texture analyser.
Rheology Solutions Instrument:	HAAKE CaBER 1, HAAKE Viscotester 550, HAAKE RotoVisco. HAAKE RheoStress, HAAKE MARS.

Rheology Solutions

Return

Copyright: Rheology Solutions Pty Ltd 2011

Industry Term: Melt Fracture

Process:	Production (Extrusion).
Definition:	Flow instability. When a polymeric material is highly elastic, extrudate shows poor surface quality at high extrusion rates. Due to extruder set-up and elastic limits of polymer causing turbulent flow conditions. The upper limit for die swell testing.
Governing Properties:	Viscoelastic properties are important measures of the propensity of a melt to exhibit melt fracture. They are measured using a frequency sweeps on a CS rheometer. The onset of melt fracture can be examined on a small scale using a mini-extruder, die swell can be monitored using die swell measurements.
Rheology Solutions Instrument:	HAAKE RheoStress, HAAKE MARS, HAAKE PolyLab OS & Die Swell Tester

Rheology Solutions

Return

Copyright: Rheology Solutions Pty Ltd 2011

Industry Term: Mouthfeel

Process:	Consumption.
Definition:	A combined experience from the sensations of the skin in the mouth during and/or after ingestion.
Governing Properties:	Liquid properties – Extensional Viscosity, G', G'', h*, Shear Viscosity, Thixotropy etc. Also related to solid mechanical properties like adhesiveness, cohesiveness, brittleness, hardness etc, measured according to Szczeniak on a texture analyser.
Rheology Solutions Instrument:	HAAKE CaBER 1, HAAKE Viscotester 550, HAAKE RotoVisco, HAAKE RheoStress, HAAKE MARS.

Rheology Solutions

Return

Copyright: Rheology Solutions Pty Ltd 2011

Industry Term: Processability

Process:	Production.
Definition:	Related to the amount of energy required to perform the relevant production steps on a material.
Governing Properties:	Depending on the process, small scale machines (extruders, mixers etc) can be used to estimate (through their relative torque, temperature and rpm inputs) the relative processability of different materials. Direct measurement of extensional properties, using an extensional rheometer, of viscoelastic properties, eg frequency or temperature sweeps, using a CS rheometer and of the behaviour in shear – using flow curves from a CR viscometer - can all provide valuable information for predicting the processability of a given material.
Rheology Solutions Instrument:	HAAKE CaBER 1, HAAKE Viscotester 550, HAAKE RotoVisco, HAAKE RheoStress, HAAKE MARS, HAAKE PolyLab OS & RheoMex or RheoMix, Marimex ViscoScope.

Rheology Solutions

Return

Copyright: Rheology Solutions Pty Ltd 2011

Industry Term: Ribbing

Process:	Production (Roller Coating, Extrusion, Cure).
Definition:	A striped film in the direction of roll coating.
Governing Properties:	Flow properties at low shear dominate the possibilities for levelling, these properties are measured using yield point and flow loop data, on a CR viscometer. Viscoelastic properties also play a part in levelling and in the advent of ribbing, they are measured using a frequency sweep on a CS rheometer.
Rheology Solutions Instrument:	HAAKE Viscotester 550, HAAKE RotoVisco, HAAKE RheoStress, HAAKE MARS.

Rheology Solutions

Return

Copyright: Rheology Solutions Pty Ltd 2011

Industry Term: Shelf Life

Process:	Storage.
Definition:	The maximum time interval in which a material may be kept in a usable condition during storage.
Governing Properties:	For liquid foods, shelf life depends, amongst other things on how the product behaves rheologically. Yield point and shear viscosity measured at low shear rates on a CR viscometer – dictate phase separation. Frequency sweeps, performed on a CS rheometer indicate the continuing strength of the internal structure. Also related to solid rheological properties, like adhesiveness, cohesiveness, brittleness, hardness etc, measured according to Szczeniak on a texture analyser.
Rheology Solutions Instrument:	HAAKE Viscotester 550, HAAKE RotoVisco, HAAKE RheoStress, HAAKE MARS.

Rheology Solutions

Return

Copyright: Rheology Solutions Pty Ltd 2011

Industry Term: Spread

Process:	Production (Coating/ Cure).
Definition:	Coverage, usually at the specified dry film thickness.
Governing Properties:	Properties in (low) shear dictate spread. Use a CR viscometer to generate flow loops and yield point.
Rheology Solutions Instrument:	HAAKE Viscotester 550, HAAKE RotoVisco, HAAKE RheoStress, HAAKE MARS.

Rheology Solutions

Return

Copyright: Rheology Solutions Pty Ltd 2011

Industry Term: Tails

Process:	Production (Dip coating/ Cure).
Definition:	Excess materials remaining after substrate is withdrawn from the coating fluid.
Governing Properties:	Extensional properties dominate when lifting an enrobed material from the coating. Use an extensional rheometer to measure extensional properties. Low shear viscosity is important also, and can be calculated from a flow loop, generated by a CR viscometer. Similarly, viscoelasticity plays a part in keeping the fluid on the enrobed surface, these can be measured using frequency sweeps on a CS rheometer.
Rheology Solutions Instrument:	HAAKE CaBER 1, HAAKE Viscotester 550, HAAKE RotoVisco, HAAKE RheoStress, HAAKE MARS.

Rheology Solutions

Return

Copyright: Rheology Solutions Pty Ltd 2011

Industry Term: Workability

Process:	Production.
Definition:	The relative ease with which a material may be formed by rolling, extruding, forging, etc.
Governing Properties:	Flow properties in shear dominate the workability parameter, they can be measured using yield point measurement and flow curves, on a CR viscometer. Viscoelastic properties influence the power required for good mixing, measured using frequency sweeps on a CS rheometer. Instrumented mixers and extruders can measure relative performances for different configurations and blends.
Rheology Solutions Instrument:	HAAKE CaBER 1, HAAKE Viscotester 550, HAAKE RotoVisco, HAAKE RheoStress, HAAKE MARS, HAAKE PolyLab OS & RheoMex or RheoMix, Marimex ViscoScope

Rheology Solutions

Return

Copyright: Rheology Solutions Pty Ltd 2011

Equipment Type

EQUIPMENT NAME	TYPE
Viscotester 550	Rotational Viscometer
RotoVisco	Rotational Viscometer
ViscoScope	On-line Torsional Motion Rheometer
RheoStress	Controlled Stress Rheometers
MARS	Modular R&D Controlled Stress Rheometer
CaBER 1	Extensional Rheometer
PolyLab OS / EuroLab	Mixers, Extruders

NOTE:

- The PolyLab OS and EuroLab, are laboratory / pilot scale mixers and extruders and therefore exhibit the same range of shear rates which occur in full-scale processing. Therefore a shear range is not a relevant quantity for this equipment.
- The CaBER 1 is an extensional rheometer and does not exert shear rates or stresses, but rather extensional ones.
- The shear rate of the rotational instruments (Viscotester, RotoVisco, RheoStress, MARS) can be expanded using alternative sensors geometries.
- The ViscoScope continuously measures a single point viscosity in the pipe or tank at approximately 4 s^{-1}.

Disclaimer:
All of the products included in this document are correct at the time of printing. These products may alter or be discontinued at a later stage.

Rheology Solutions

Return

Copyright: Rheology Solutions Pty Ltd 2011

Shear Rate Table

INDUSTRY TERM	SHEAR RATE	INDUSTRY TERM	SHEAR RATE
Body	10 - 100 s^{-1}	Haptic	0 - 10000 s^{-1}
Build	0.01 - 0.1 s^{-1}	Kinesthetics	10 - 100 s^{-1}
Chewy	10 - 100 s^{-1}	Mealy	10 - 100 s^{-1}
Consistency	10 - 100 s^{-1}	Melt Fracture	<0.001 s^{-1}
Cover	0.01 - 0.1 s^{-1}	Mouthfeel	10 - 100 s^{-1}
Die Swell	<0.001 s^{-1}	Processability	<0.001 - 10000 s^{-1}
Feet	0.1 - 1 s^{-1}	Shelf Life	<0.001 s^{-1}
Flow	10 - 1000 s^{-1}	Spread	0.1 - 1 s^{-1}
Getaway	10 - 100 s^{-1}	Tails	0.1 - 1 s^{-1}
Gum Quality	10 - 100 s^{-1}	Workability	1 - 1000 s^{-1}

Rheology Solutions

Return

Copyright: Rheology Solutions Pty Ltd 2011