

MECHANICAL PROPERTIES OF FOOD MATERIALS



The background of the slide is a close-up, high-contrast photograph of a coffee machine's internal components. A bright orange liquid, likely coffee, is being poured from a spout into a dark, reflective container below. The image is partially obscured by text boxes.

Mechanical properties of food refer to the physical characteristics of food that affect its texture, quality, and sensory attributes.

- The **structure**, **physical state**, and **rheology** of food all play a role in how it behaves mechanically.
- These characteristics are required for process design, estimating other characteristics, describing foods, and determining quality.

Classification



Properties	Description
Acoustic properties	Describe the way in which sound waves interact with food.
Mass-volume-area-related properties	Describe the relationship between the mass, volume, and surface area of a food product.
Morphometric properties	Describe the size and shape and dimension of food products.
Surface properties	Describe the physical and chemical characteristics of the surface of a food product.
Rheological properties	Describe the flow and deformation behavior of food products.



1. Acoustic properties

Used to assess: Food quality, such as measuring the **tenderness** of meat or the ripeness of fruits by analyzing the sound they emit when struck or squeezed (**crispness**).

2. Mass-volume-area-related properties

Used to determine: The **density**, **porosity**, and **texture** of a product.



Density = Mass/Volume

QUALITY CONTROL

Location:
Date of inspection:
Time of inspection:
Inspected by:

OBSERVATIONS

Description

Sample

Observation

3. Morphometric properties

Used to determine: The uniformity of a product and the distribution of its components.

4. Surface properties

Used to determine: Adhesion, friction, and other properties that affect the appearance, shelf life, and quality of a product.

5. Rheological properties

Used to determine: The **viscosity**, **elasticity**, and other properties that affect the texture and mouthfeel of a product.



Elastic properties

Describes how a material deforms when subjected to a load and how it returns to its original shape when the load is removed.

- Ex: Elastic modulus or Young's modulus, Poisson's ratio

Plastic properties

Describes how a material deforms beyond its elastic limit, leading to permanent deformation or failure.

- Ex: Yield stress, Ductility, Toughness.

Stress and **strain** are fundamental concepts in these properties.

Uses

In food quality

- A) Quality control
- B) Product development
- C) Consumer acceptance
- D) Shelf life

In processing

- A) Size reduction
- B) Mixing
- C) Extrusion
- D) Packaging

In equipment design

- A) Material selection
- B) Equipment design
- C) Equipment optimization
- D) Equipment maintenance



Follow

We deliver End-to-End Engineering Design and Construction Management
Projects in Food and Beverage Industry

PMG Engineering

———— Meeting Global Benchmarks ————



Process Engineering



Project Management



Food Safety



Automation



Mechanical & Electrical



www.pmg.engineering