

Physical conversion operations of food



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CONTENT



- ❖ **Mixing**
- ❖ **Emulsification**
- ❖ **Extraction**
- ❖ **Filtration**
- ❖ **Centrifugation**

MIXING



- Industrial food mixing usually refers to the process of combining two or more separate components to produce a certain level of homogeneity.
- Mixing is often an interchangeable term with **blending**.
- Mixing is fundamental to food processing operations, such as in the,
 - preparation of ingredients
 - the addition of solids to liquids
 - the development of structure and
 - incorporation of air in the dough mixing process.

The key objective of industrial food mixing is to have unvarying distribution (homogeneity) in the product



The most-common styles of industrial mixing equipment are:



- **High-Shear Mixers**
 - ❖ **Batch High-Shear Mixers**
 - ❖ **Inline High-Shear Mixers**
- **Heavy-Duty Mixers**
 - ❖ **Dual- or Multiple-Shaft Mixers**
 - ❖ **Planetary And Double-Planetary Mixers**

MIXING EQUIPMENTS



Mixing Equipment



YUEFENG BAKERY & FREESTYLE BAKE

#247439396

EMULSIFICATION



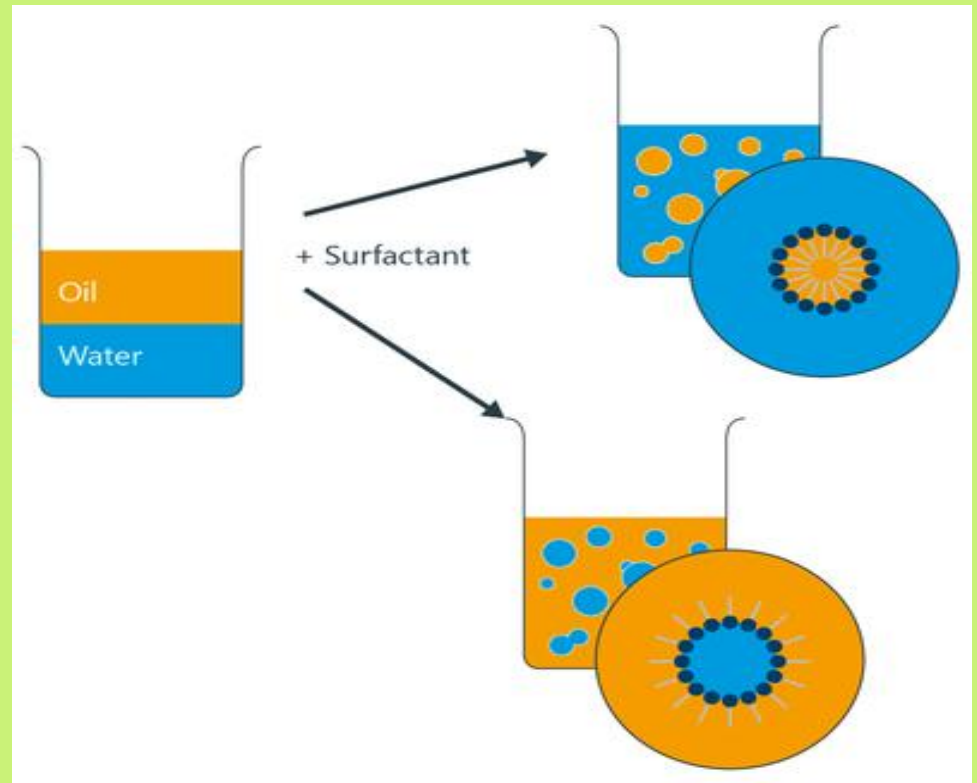
- Emulsification is defined as a process of dispersing one liquid (containing the bioactive compounds) in a second immiscible liquid, by applying electrostatic, or hydrophobic, or hydrogen bonding interactions between the bioactive compounds and an encapsulating material.
- An **emulsifier** (also known as an "emulgent") is a substance that stabilizes an emulsion by increasing its kinetic stability.
- Emulsifiers are compounds that typically have a polar or hydrophilic (i.e. water-soluble) part and a non-polar (i.e. hydrophobic or lipophilic) part

EXAMPLE OF EMULSIFICATION



Cream: Oil-in-Water

Butter: Water-in-Oil



Examples of food emulsifiers are:



- **Egg yolk** – in which the main emulsifying agent is **lecithin**. In fact, *lecithos* is the Greek word for egg yolk.
- **Mustard** – where a variety of chemicals in the **mucilage** surrounding the seed hull act as emulsifiers
- **Soy lecithin** is another emulsifier and thickener
- **Pickering stabilization** – uses particles under certain circumstances
- **Sodium phosphates**
- **Mono- and diglycerides** - a common emulsifier found in many food products (coffee creamers, ice-creams, spreads, breads, cakes)
- **Sodium stearoyl lactylate**
- **DATEM** (diacetyl tartaric acid esters of mono- and diglycerides) – an emulsifier used primarily in baking
- Simple cellulose – a **particulate emulsifier** derived from plant material using only water

EXTRACTION



- **The objective of extraction is to recover valuable soluble components from raw materials by primarily dissolving them in a liquid solvent, so that the components can be separated and recovered later from the liquid.**
- **Extraction works according to the principle that soluble components can be separated from insoluble or less soluble components by dissolving them in a suitable solvent.**

There are two extraction methods:



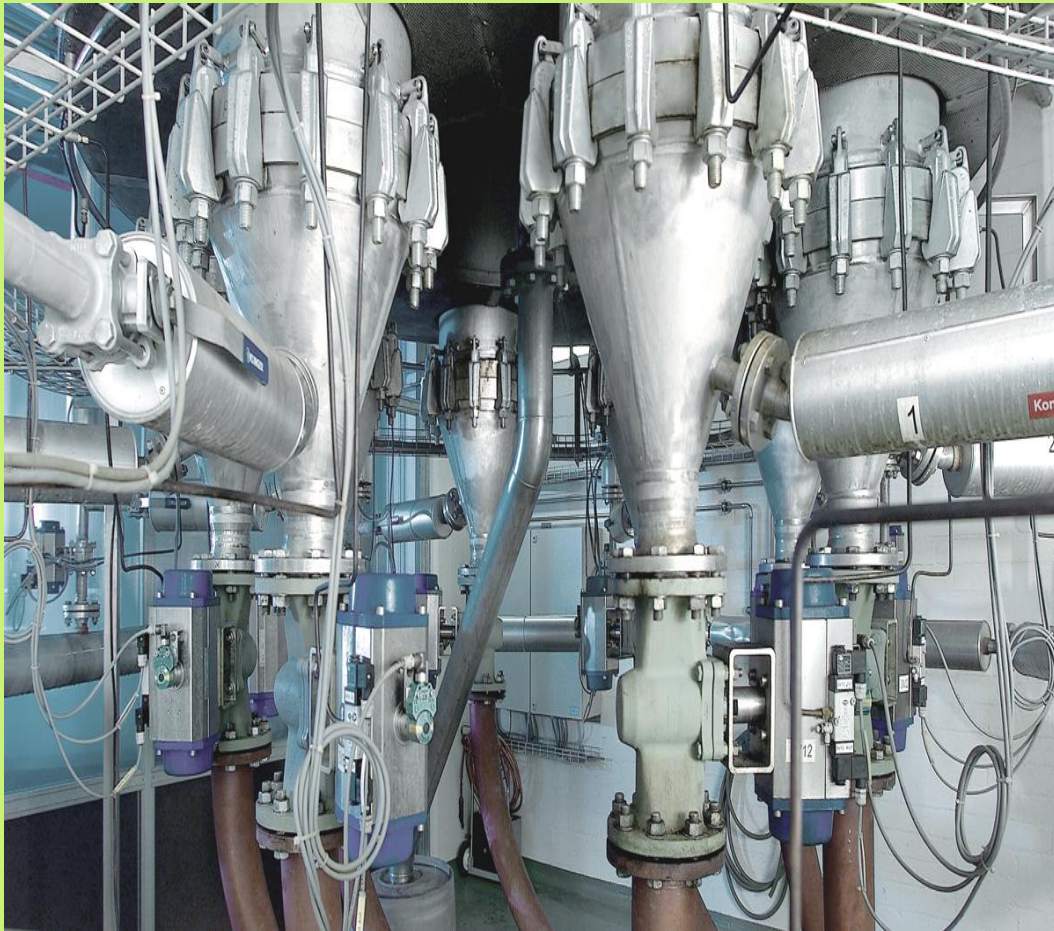
- **Lateral flow extraction**
- This is the simplest extraction method. It is a repeated extraction with fresh solvent (lateral flow extraction). However, this is rarely used because of the costs of solvent
- **Countercurrent extraction**
- The most common method used is countercurrent extraction, either in a batch or continuous process

EXAMPLES



- Extraction is applied to a wide variety of food products. Typical examples are ,
- the extraction of sugar from sugar-beets or sugar-cane
- the extraction of oil from oil seeds and from virgin pomace
- the extraction of coffee extract from coffee beans
- the extraction of caffeine from coffee beans
- the extraction of various other compounds such as proteins, pectins, vitamins, pigments, essential oils, aroma compounds, flavour compounds etc. from many different materials.

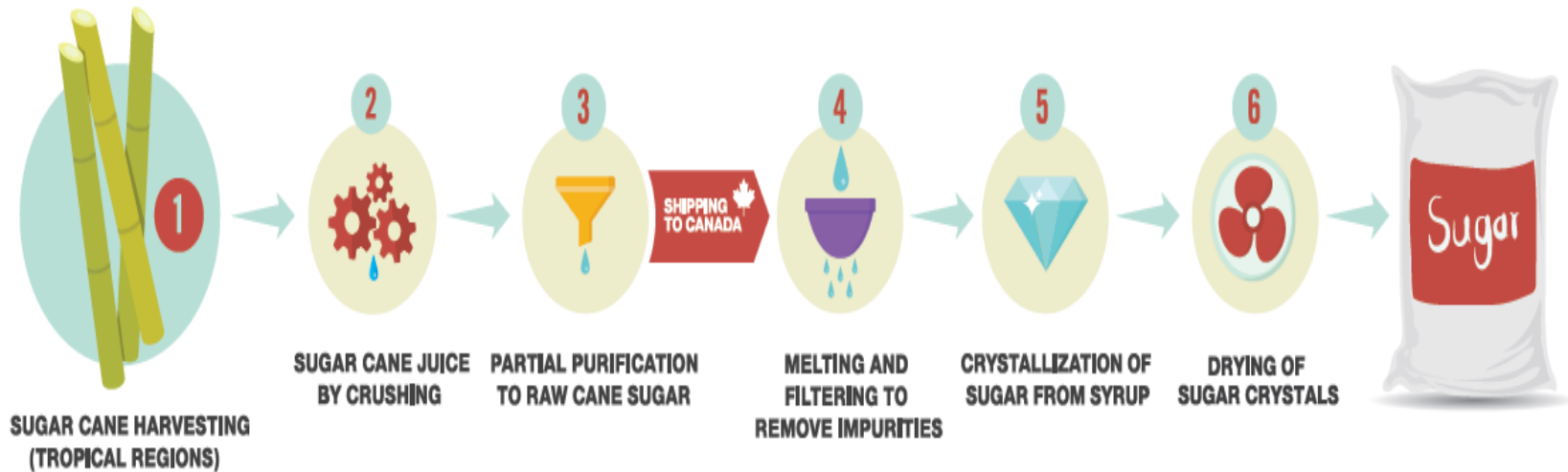
COFFEE EXTRACTION



SUGAR EXTRACTION



CANE SUGAR REFINING



OIL EXTRACTION



FILTRATION



- **Filtration is the separation of solids from a suspension in a liquid by means of a porous medium, screen or filter cloth, which retains the solids and allows the liquid to pass through.**
- **Filtration equipment operates either by the application of pressure (pressure filtration) to the feed side or by the application of a vacuum (vacuum filtration) to the filtrate side.**

VACCUM DRY FILTER

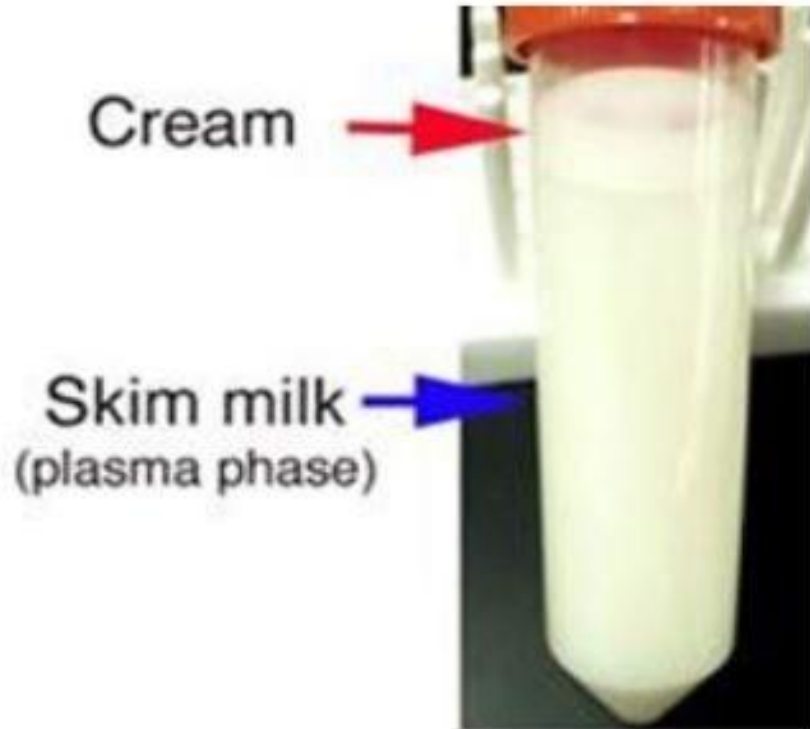


CENTRIFUGATION



- Sedimentation and centrifugation are used to separate immiscible liquids and solids from liquids. The separation is carried out by the application of either natural gravity or centrifugal forces.
- TYPES OF CENTRIFUGES ARE,
- Ordinary centrifuge(10,000 rpm)
- Ultra centrifuge (50,000-80,000 rpm)
- RPM-ROTATION PER MINUTE.(unit of centrifugal speed)

EXAMPLE OF CENTRIFUGATION





THANK YOU