***Lec.3******Food Technology***

***Food processing***

**Food processing combines raw food ingredients to produce marketable food products that can be easily prepared and served by the consumer. Food processing dates back to the prehistoric ages when crude processing incorporated fermenting, sun drying, preserving with**[**salt**](https://en.wikipedia.org/wiki/Salt)**, and various types of**[**cooking**](https://en.wikipedia.org/wiki/Cooking)**(such as roasting, smoking, steaming, and baking). Food processing is the set of methods and techniques used to transform raw ingredients into food or food into other forms for consumption by the**[**food processing industry**](http://www.newworldencyclopedia.org/entry/Food_industry)**.**

***Benefits of food processing include:***

 **1-Prevent microbial growth or toxin production by microbes, or reduce these risks to acceptable levels.**

**2- Stop or slow deteriorative chemical or biochemical reactions.**

**3- Makes many kinds of foods safe to eat by deactivating spoilage and pathogenic M.O.**

**4- Processing can also reduce the incidence of food borne disease.**

**5- Fresh foods are more likely to harbour pathogenic M.O. (e.g. *Salmonella*).**

**6- Maintain and/or improve nutritional properties of food.**

**7- Make food more palatable and attractive.**

**8- Increasing food consistency,** **storage stability or shelf life of food.**

**9- Increases yearly availability of many foods.**

**10- Enables transportation of delicate perishable foods across long distances.**

**11-Processed foods are usually less susceptible to early spoilage than fresh foods and are better suited for long distance transportation from the source to the**[**consumer**](https://en.wikipedia.org/wiki/Consumer).

**12-Modern food processing also improves the quality of life for people with allergies,**[**diabetics**](https://en.wikipedia.org/wiki/Diabetes)**, and other people who cannot consume some common food elements. 13- Food processing can also add extra nutrients such as**[**vitamins**](https://en.wikipedia.org/wiki/Vitamin)**.**

**14- Processed foods may include additives such as coloring, flavorings and preservatives.**

**15- Easing marketing and distribution tasks.**

***Performance parameters for food processing***:

When designing processes for the food industry, the following performance parameters may be taken into account:

**1-**[**Hygiene**](https://en.wikipedia.org/wiki/Hygiene)**, e.g. measured by number of micro-organisms per mL of finished product.**

**2-**[**Energy efficiency**](https://en.wikipedia.org/wiki/Efficient_energy_use)**measured e.g. by “ton of steam per ton of sugar produced.**

**3-**[**Minimization of waste**](https://en.wikipedia.org/wiki/Waste_minimisation)**, measured e.g. by percentage of peeling loss during potatoes peeling.**

**4-**[**Labour**](https://en.wikipedia.org/wiki/Labour_economics)**used, measured e.g. by “number of working hours per ton of finished product.**

**5-Minimization of cleaning stops measured e.g. by “number of hours between cleaning stops.**

***The aims of the food industry today, as in the past, are fourfold:***

 **1. To extend the period during which a food remains wholesome (the shelf life) by preservation techniques which inhibit microbiological or biochemical changes and thus allow time for distribution, sales and home storage.**

 **2. To increase variety in the diet by providing a range of attractive flavours, colours, aromas and textures in food.**

 **3. To provide the nutrients required for health.**

 **4. To generate income for the manufacturing company.**

***Food Processing Operations:***

**The main processes used to produce foods of satisfactory biological standards and acceptable eating quality, are mechanical processes, heating, cooling, the use of additives, and fermentation processes.**

***Mechanical Processes:***

**Many raw food materials undergo a preliminary treatment by a mechanical process; first involve size reduction such as cutting into smaller pieces such as potatoes into small chips before frying. In some fruit and vegetables, enzymatic browning may occur, the grey-black discolouration found in cut potatoes and the brown discolouration found in cut apples is due to the action of the enzyme polyphenoloxidase (PPO) on phenolic compounds, PPO is present in apricot, pear, banana, avocado and sweet potatoes.**

 ***Such enzymatic reactions can be prevented or reduced by several ways:***

**1- Chilling reduces enzymatic reaction rates.**

**2- Lowering pH to below 2.5 inhibits enzyme activity.**

**3- Additives inhibit enzyme activity such as the use sodium metabisulphate, salt, potassium phosphate and ascorbic acid.**

**4-Heat inactivates enzyme activity such as the use of blanching.**

**5- Complete exclusion of air (oxygen) prevents oxidative reactions.**

**Other mechanical treatments of foods include filtration and centrifugation, in a cream separator; less dense fat globules are separated from the water and dissolved lactose and proteins of milk. The final form of mechanical treatment is protective packaging; this is a physical barrier such as a can, jar or plastic sachet for protection against spoilage, organisms, dirt, and mechanical damage.**

***Raw Material Preparation:***

**The objective of raw material preparation is the removal and separation of contaminating materials from the food in order to attain a suitable condition for further processing; contaminants may be soil, micro-organisms and pesticide residues, washing is widely applied as a first processing step. Many vegetables and some fruits require peeling which can be achieved by mechanical cutting, or by the application of steam, hot water or hot air.**

 ***Heating*:**

**As well as destroying pathogens and other spoilage organisms, heating is used to improve food palatability.**

***Steam and Water Heating:***

**Blanching is an important step in processing of fruits and green vegetables and involves exposure to high temperatures for a short period, the function of blanching is to inactivate or retard surface bacterial and enzyme action which causes rapid degeneration of quality.**

***Evaporation:***

**Evaporation is the partial removal of water from liquid food by boiling used to pre-concentrate, it is used to process concentrated milk, starch, fruit juices, as well as sugar processing. Since many liquid food products are heat sensitive, it is often necessary to work at reduced temperatures; this is achieved by boiling under part vacuum.**

***Pasteurization, Sterilization and UHT:***

**In pasteurization results in a partial reduction of the enzyme and bacterial activity within a product giving a limited shelf life. Ultra high temperature (UHT) processing uses a temperature exceeding 135oC for very short times, it is applied to low viscosity liquid products, and this uses indirect heating in plate and frame or tubular heat exchangers.**

***Emulsification*:**

**Emulsification occurs when two liquids which are not soluble in one another are dispersed into fine droplets within each other. Water-in-oil emulsions, such as butter, consist of very fine droplets of water containing dissolved salts; lactose and lactic acid are dispersed throughout the butter fat or oil phase. Oil-in-water emulsions, such as mayonnaise consists of minute droplets of a vegetable oil are dispersed in an aqueous solution of vinegar.**

**To prevent liquids in an emulsion from separating into two layers, an emulsifying agent is used, Egg yolk, which contains a lecithin, is used as the emulsifying agent.**

***Food processing methods:***

 **Common food processing techniques include:**

* **1- Removal of unwanted outer layers, such as**[**potato**](http://www.newworldencyclopedia.org/entry/Potato)**peeling or the skinning of**[**peach**](http://www.newworldencyclopedia.org/entry/Peach)
* **2- Chopping or slicing, such as to produce diced**[**carrots**](http://www.newworldencyclopedia.org/entry/Carrot)
* **3- Mincing and macerating**
* **4- Liquefaction, such as to produce fruit juice**
* **5- Emulsification**
* **6- Cooking, by methods such as baking,**[**boiling**](http://www.newworldencyclopedia.org/entry/Boiling)**, frying, steaming and grilling**
* **7- Mixing**
* **8- Addition of gas such as air entrainment for bread or gasification of soft drinks**
* **9- Pickling**
* **10- Spray drying**
* **11- Pasteurization**
* **12- Packaging**