Mango Milk – What?

Starring:

Mango milk is another common type of milk under dairy segment; which can be made by incorporating ripe mango pulp or sometimes by adding only color. Generally, mango milk is such kind of flavored milk which is made by mixing the mango pulp with milk or sometimes without pulp. Then the mixed milk undergoes through the high temperature short time treatment process namely pasteurization/UHT/Retorting process.

The purpose of UHT treated milk is to make the milk safe for consumption with a longer shelf life [better that the raw milk itself & pasteurized milk]. UHT milk don't need the refrigeration as the treatment destroys all bacteria. Same time the treatment process preserves the original flavor, taste as well as the nutritional value. It is also to say that, the cocoa solid have bacterial spore [mesophilic spore, thermophilic spore]; which should be treated by UHT treatment.

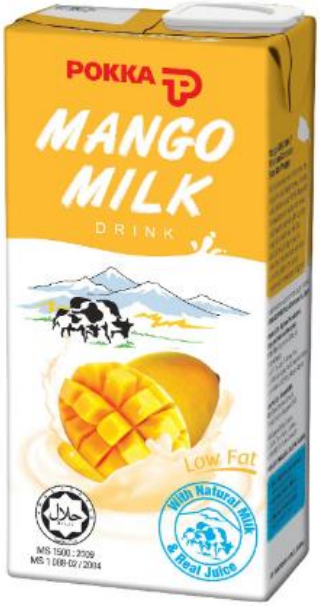

Figure: Mango Milk in sterile pack

Why Industry performs Mango Milk:

Mango milk is made up with white milk, mango pulp or sometimes without pulp and adding with sugar. Mango milk can provide with some essential nutrients such as high quality protein to bone building nutrients, including calcium, vitamin D, phosphorus etc.

When mango milk is incorporated with mango pulp, then it contains some fruit contents also.

If anyone willing to take the mango milk instantly, then it should be consumed just after preparation. But on the other hand, if anyone is willing to consume it at his/her convenient time then only the industrial processing can help to make a longer shelf life.

To make a longer shelf life for the mango milk, below mentioned points should be taken in consideration.

- Microbial condition: to kill mesophilic and thermophilic spore, a process system is mostly needed.
- Reduce particle density: the particle density should be reduced.
- Increase viscosity: the cocoa particle posses the ability to settle down. So, viscosity increasing is a must the suspension long time stabilized.

Generally, the pulp may contain bacterial spore, saccharomyces etc. [mesophilic spore, thermophilic spore]; which can tolerate the pasteurization process or after the pasteurization process they can remain alive in the finished products as spore. If the spore former gets remain into the processed milk, then it has the maximum probability to spoil the product as well as to cause illness after consumption. So, a mechanized heat treatment system will help to control the mesophilic and thermophilic spore.

The objective of UHT/Retort is Food Safety, ensuring longer shelf life as well as convenience while carrying. As the treatment ensures the destroying of all micro-organisms, so it ensures public health concern to an acceptable level. It is also to say that; raw milk has a very short shelf life where as UHT process tends to provide a longer shelf life [06 – 09 months]

Its only an industrial move, who can make the all issues in a successful manner. The long time stability as well as intended use of the product has made the industrialist to go for industrial production.

Pasteurization:

Pasteurization is a process, named after scientist Louis Pasteur, that applies heat to destroy pathogens in foods. For the dairy industry, the term "pasteurization," "pasteurized" and similar terms means the process of heating every particle of milk or milk product, in properly designed and operated equipment, to one of the temperatures given in the following chart and held continuously at or above that temperature for at least the corresponding specified time: [Source: IFDA]

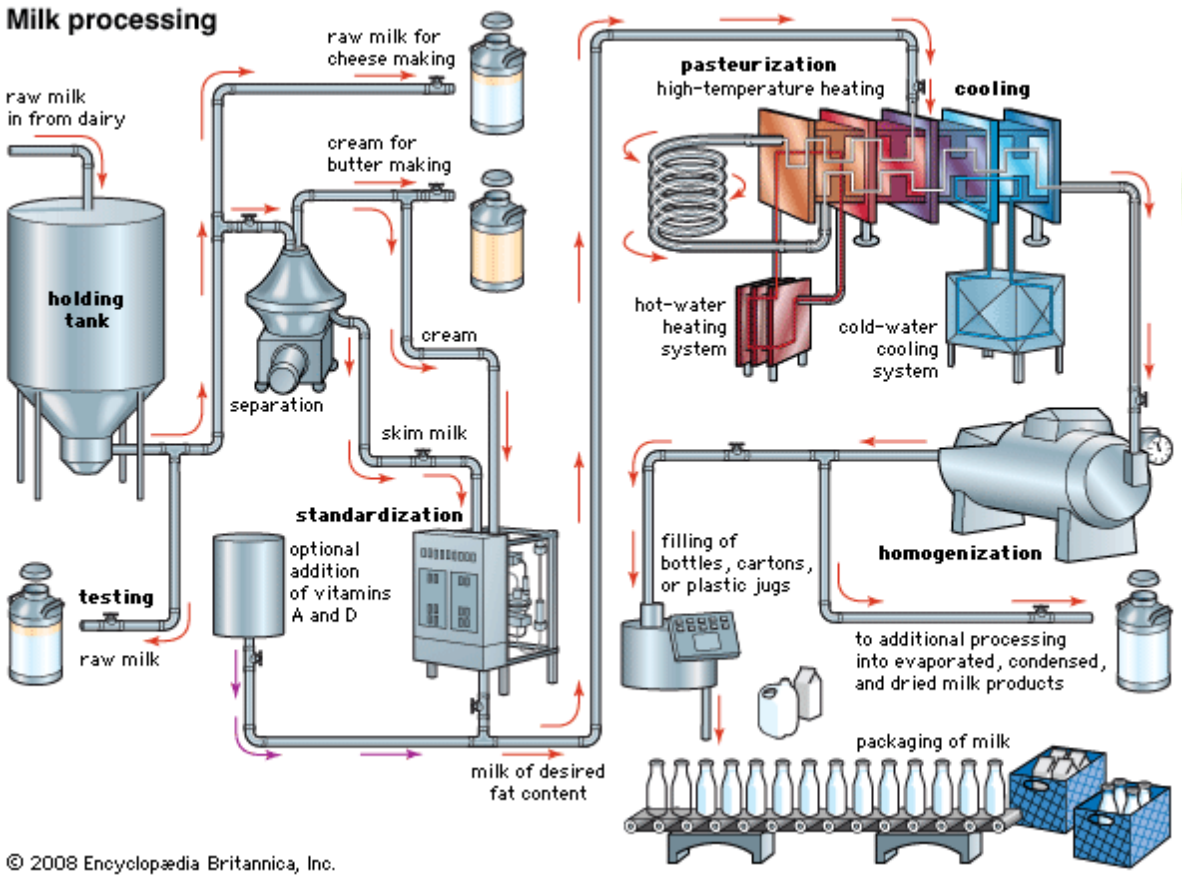

Figure: Pasteurization Process to Filling

Pasteurization Type, Temperature and Holding Time:

Temperature	Holding Time	Pasteurization Type
63 C [145 F]	30 minutes	Vat Pasteurization
72 C [161 F]	15 seconds	High Temperature Short Time [HTST]
89 C [191 F]	1.0 seconds	Higher Heat Shorter Time [HHST]
90 C [194 F]	0.5 seconds	Higher Heat Shorter Time [HHST]
94 C [201 F]	0.1 seconds	Higher Heat Shorter Time [HHST]
96 C 204 F]	0.05 seconds	Higher Heat Shorter Time [HHST]
100 C [212 F]	0.01 seconds	Higher Heat Shorter Time [HHST]
138 C [280 F]	2.0 seconds	Ultra Pasteurization [UP]

Source: IFDA

If the fat content of the milk product is 10% or more, or if it contains added sweeteners, or if it is concentrated (condensed), the specific temperature shall be increased by 3C [5F]. the below mentioned table can be maintained.

Temperature	Holding Time	Pasteurization Type
69 C [155 F]	30 minutes	Vat Pasteurization
80 C [175 F]	25 seconds	High Temperature Short Time [HTST]
83 C [180 F]	15 seconds	High Temperature Short Time [HTST]

Source: IFDA

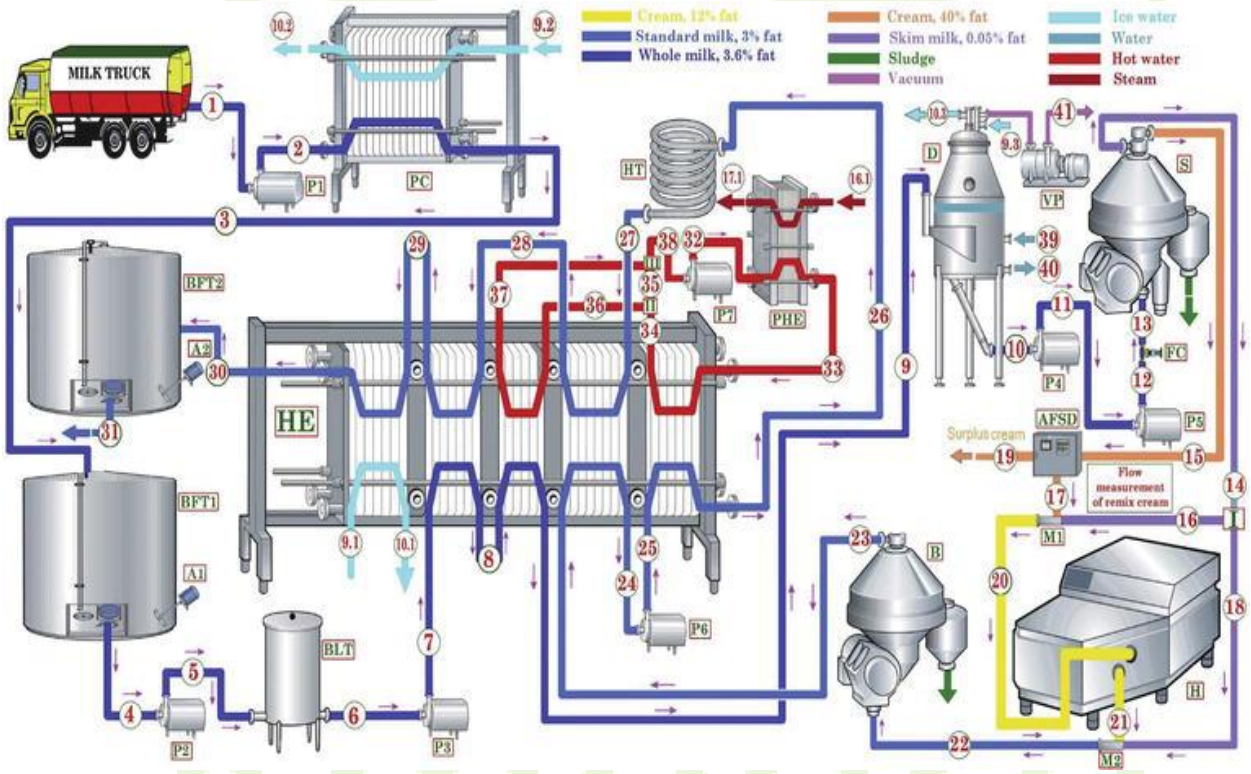

Figure: Pasteurization Process

Different types of thermal processing methods:

Name of Treatment	Temperature	Holding Time	Target	Remarks
Thermization	57C – 68C	15 min	Pathogenic bacteria	Low temperature don't change the structure and taste of milk
Batch pasteurization [LTLT] [Low Temp Long Time]	63C	30 min	Pathogenic bacteria	Long holding time changes the protein structure and taste
Flash Pasteurization [HTST] [High Temp Short Time]	72C – 74C	15 – 20 sec	Pathogenic bacteria	-

UHT [Ultra High Temperature]	135C – 140C	02 – 04 sec	*Coxiella burnetii*	Kills all vegetative form of microbes. Extended shelf life.
Canned Sterilization [Autoclave] [Wet Treatment]	115C – 121C	10 – 20 min		Kills all vegetative form of microbes. Extended shelf life.

Differences in between Pasteurized Milk & UHT Milk:

It is clear that pasteurized milk and UHT milk both undergo through a heat treatment as well as holding time. But UHT treatment is more and more sensitive rather than the pasteurization.

For pasteurized milk, the milk is safe to consume, but the milk has a shorter shelf life [shelf life may be 15-21 days]. Pasteurized milk must be kept in freezing condition. Pasteurized milk should be consumed instantly [with or without having a further heat treatment]. While long time travelling, pasteurized milk can't be kept long time in ambient temperature. Based on the heat treatment, pasteurized milk colour, taste and texture differs a little than UHT milk. Pasteurized milk is creamier. After the heat treatment, the microbial load will be found [except pathogenic microbes]

For UHT milk, the milk is safe to consume, but the milk has a longer shelf life [shelf life may be 06 – 09 months]. UHT milk can be kept in normal temperature on in the ambient condition. UHT milk can be consumed immediately. While long time travelling, UHT milk can easily be kept long time in ambient temperature [longer shelf life]. Based on the heat treatment, UHT milk colour, taste and texture differs a little than pasteurized milk. UHT milk has got a slightly brownish colour. After the heat treatment, the microbial load must be nil.

Criteria	Pasteurized Milk	UHT Milk
Heat Treatment	Below 100C [lots of treatment point]	Over 100C [135 – 145C]
Holding Time	30min or 15sec [based on heat]	02 – 05sec
Shelf Life	Shorter shelf life [15 – 21 days]	Longer shelf life [06 – 09 months]
Keeping condition	In freeze	In ambient
Consumption condition	With or without having a further heat treatment	Can be consumed instantly
Travelling feasibility	Can't take while long time travelling	Can take easily
Colour, taste and texture	Little bit differed from UHT milk. Have fresh milk colour and creamier.	Little bit differed from pasteurized milk. Have a slightly brownish colour than pasteurized milk
Microbial load after industrial treatment	Microbial load will be found [except pathogenic microbes]	Microbial load must be nil.

A normal diagrammatic flow is shown here for easy understanding.

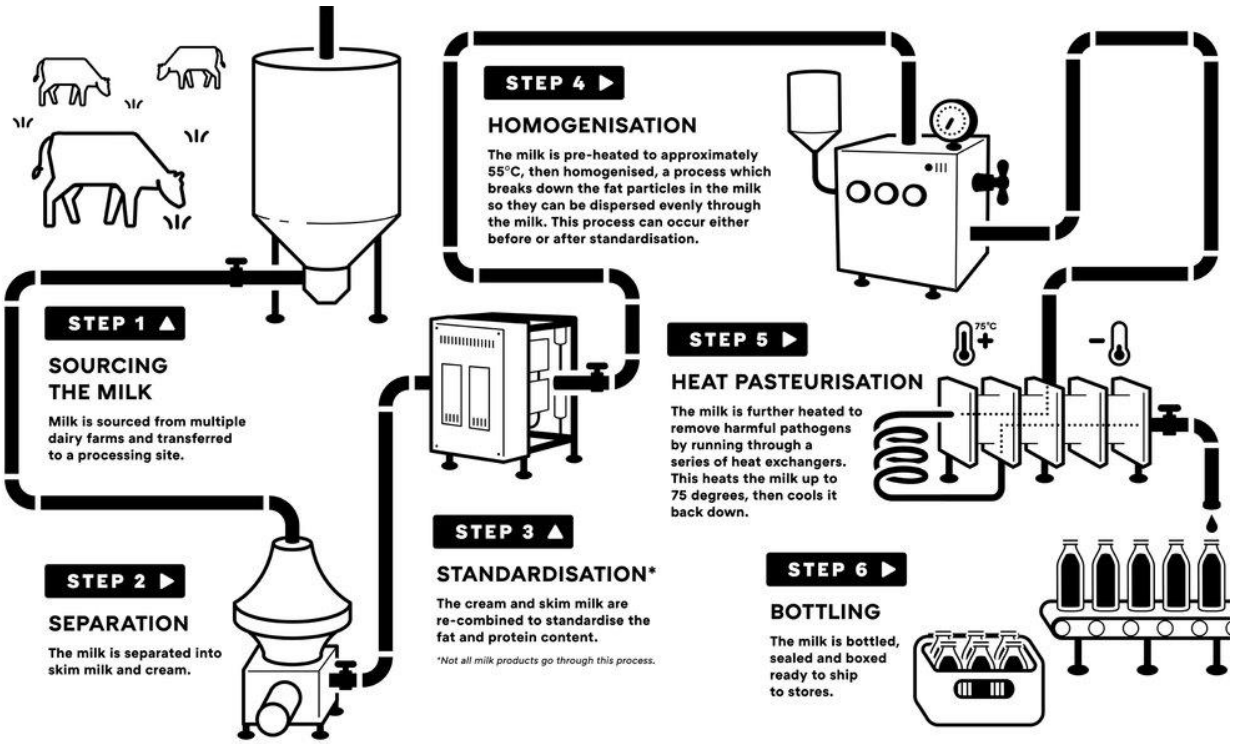

Figure: Pasteurization Process to Filling

UHT Milk:

UHT milk is basically the raw milk that undergoes a heat treatment to a specific temperature at a specific holding time in order to destroy all microbes that present in milk. UHT is a processing technology which sterilizes liquid food by applying temperature on 135 – 145C for about 02 – 05 sec. This flash temperature and holding use to kill the bacterial spore. The widely used of UHT process is in milk industry. Apart of this, UHT process can also be applied on fruit juice, wine, cream, soy milk, soups etc.

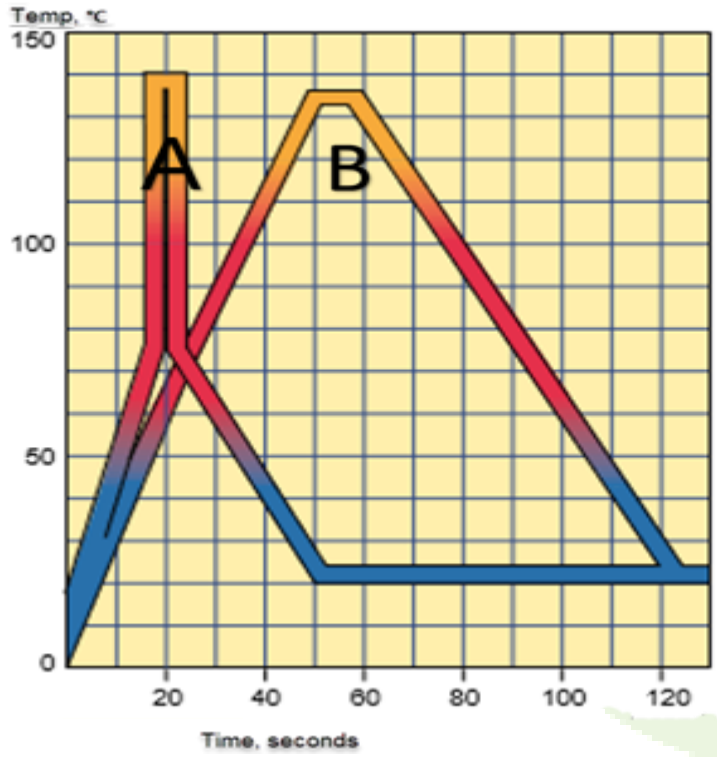

Figure: UHT Process

The graphical demonstration shows that the UHT is a quicker system for micro-organism destruction. While pasteurization process the system takes a long time to reach the active temperature, whereas the UHT system takes a shorter time to reach the activated temperature.

On the other hand, UHT holding time is also very shorter in comparison with pasteurization holding time.

UHT:

The UHT method 1st developed in 1960 & the product availability ensured on 1970.
Ultra High Temperature is a process by which milk is heated up to 135 – 145C for 02 – 05 sec & then the milk is cooled quickly at 26-30C applying aseptic transfer method as well as aseptic filling.

02 Types of UHT process is available

- Direct UHT system
- Indirect UHT system

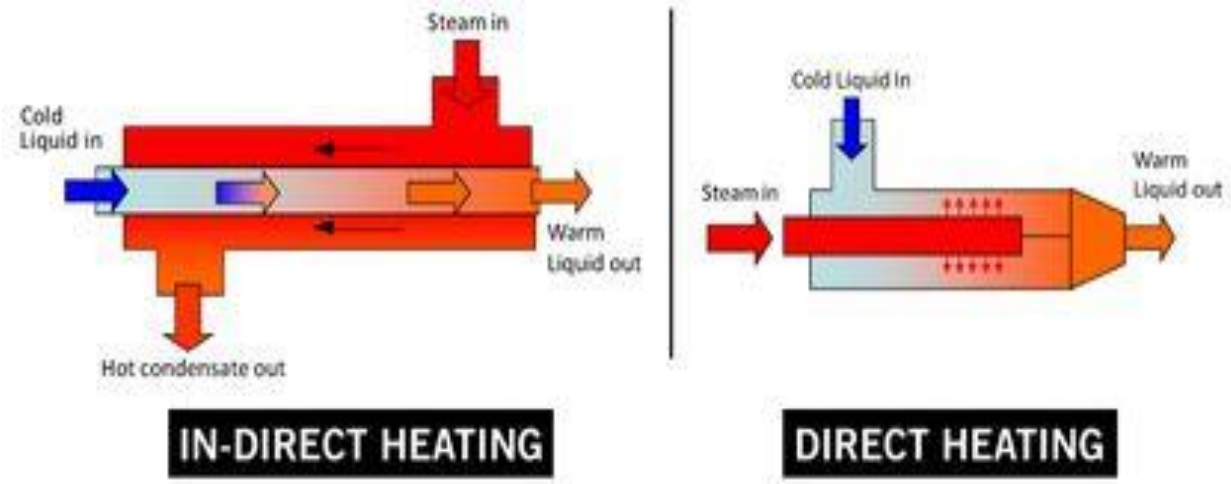

Figure: Direct Heating System & Indirect Heating System

Direct UHT System:

In direct UHT system, steam is injected into the liquid product and this heating is followed by a flash cooling system [generally, the product gets directly contact with steam]. This process requires relatively high energy consumption comparing to indirect UHT system.

In direct UHT system, the product is held at a high temperature for a short time. So, thermal damage for the sensitive product is not happened [eg. Milk]

- Injection Based – High pressured steam is injected into milk maintaining fast heating and cooling. This method is suitable only for some products. A local overheating takes place, as the product comes in contact with the nozzle.
- Infusion Based – A relatively low concentration of milk is pumped through a nozzle into a high pressured steam chamber. It has got a large surface contact area. Both low viscosity and high viscosity liquid products are suitable for this method.

Indirect UHT System:

In indirect UHT system, steam is injected through heat exchanger [generally, the product does not come into contact with steam]. This process required relatively low energy consumption comparing to direct UHT system. In this method most of the heat energy can be recovered.

03 Types of Heat Exchangers can be found

- Plate Heat Exchangers [PHE]
- Tubular Heat Exchangers {THE]
- Scraped Surface Heat Exchangers [SSHE]

The overall UHT system maintains.

- Flash heating
- Flash cooling
- Homogenization
- Aseptic Packaging

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Liquid Product Heating System

Direct Heating System

02 Types of heating process is available

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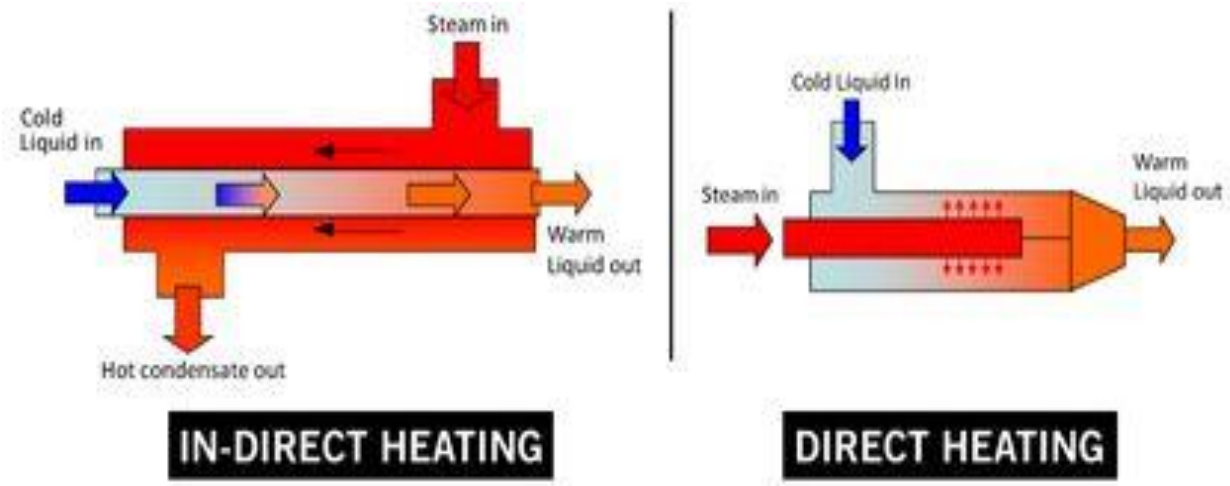

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Indirect Heating System – PHE [Plate Heat Exchanger]

Figure: Indirect Heating System – PHE [Plant Heat Exchanger]

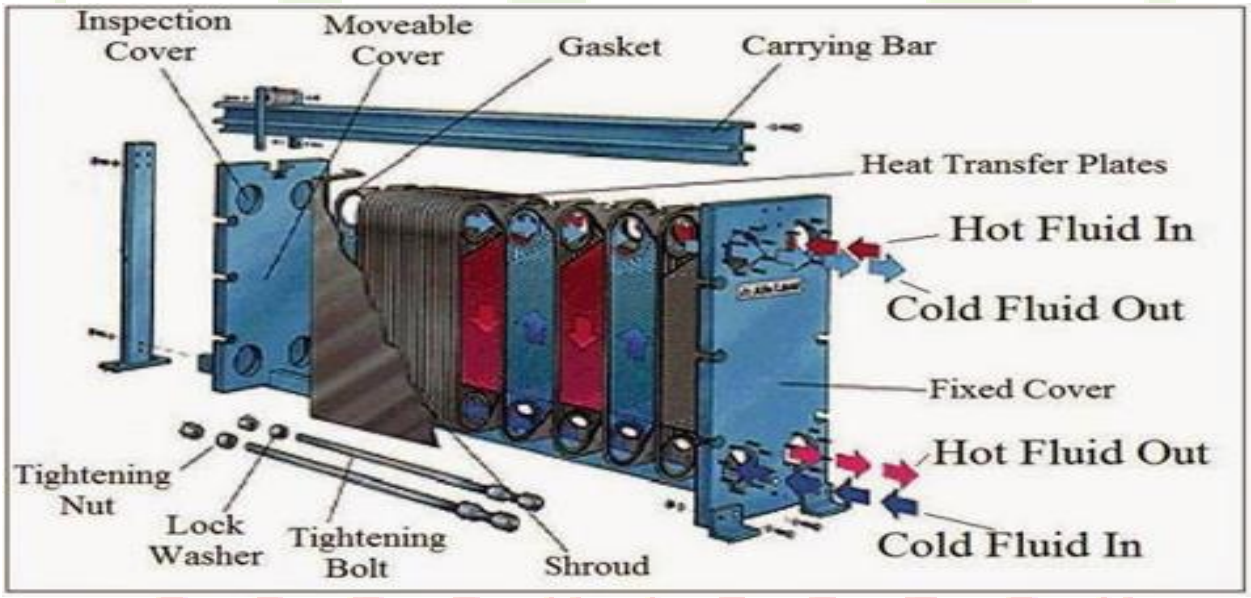

Figure: Indirect Heating System – PHE [Plant Heat Exchanger]

Application of PHE [Plate Heat Exchanger]:

- Pasteurization of Milk, Cream
- Pasteurization of Juice
- Pasteurization of Synthetic Drinks
- Pasteurization of Lachchi Drinks
- Glycol Cooler
- Batch Heating and Cooling
- Water Heater etc.

Indirect Heating System – THE [Tubular Heat Exchanger]

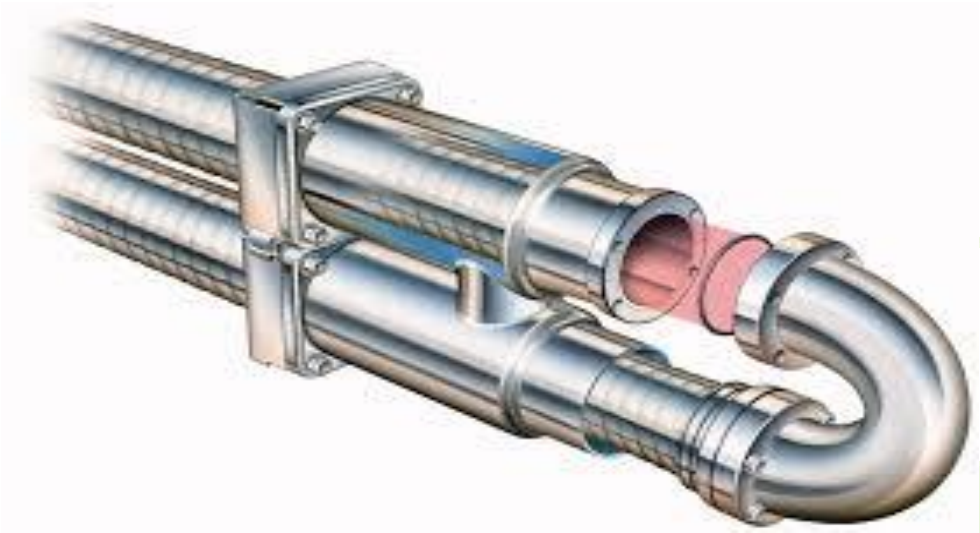

Figure: Indirect Heating System – THE [Tubular Heat Exchanger]

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Application of THE [Tubular Heat Exchanger]:

- UHT treatment of Milk
- UHT treatment of Mango Milk, Mango Milk
- Pasteurization of Juice
- Pasteurization of Lachchi Drinks
- Pharmaceuticals application etc.

Indirect Heating System – SSHE [Scraped Surface Heat Exchanger]

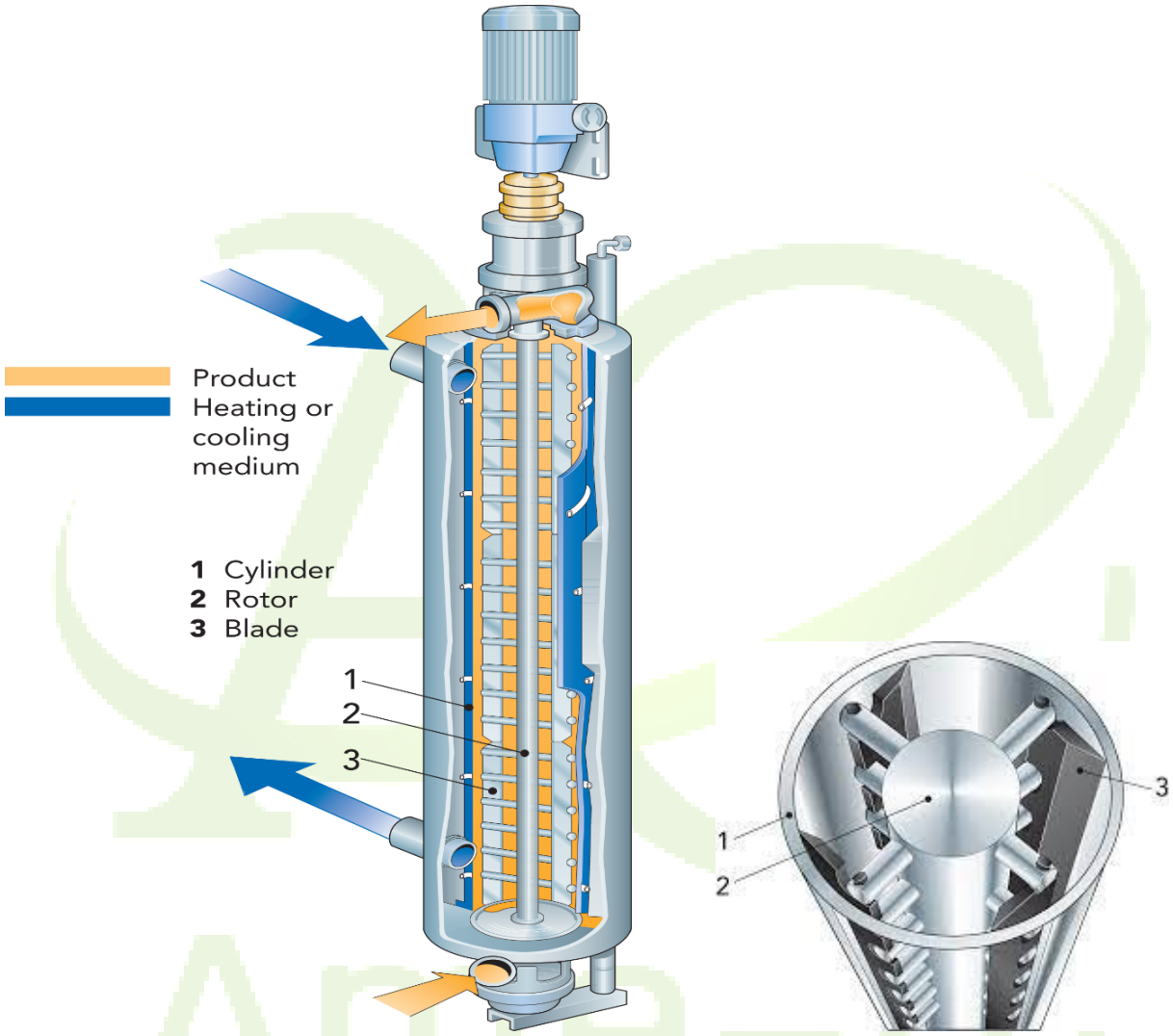

Figure: Indirect Heating System – SSHE [Scraped Surface Heat Exchanger]

Application of SSHE [Scraped Surface Heat Exchanger]:

- In Food Industry [for Heat Transfer, Crystallization and other continuous process]
- In Chemical Industry [for Heat Transfer, Crystallization and other continuous process]
- In Pharmaceutical Industry [for Heat Transfer, Crystallization and other continuous process]
- SSHE specially used for viscous, sticky products which need some degree of crystallization.

Heating System – Retorting

Retorting system is another name of Autoclave or Sterilize. Retort system includes a pressure vessel which is used in food system to make “commercial sterile”.

In a retort system, food is filled into a pouch or HDPE or in a metal can which is sealed, then the sealed container is heated extremely in high temperature 115 – 121 C for about 10 – 20 minutes.

Figure: Retort System

Application of Retorting:

- Normal and vacuum sealed can products
- Glass Jar products
- Aluminium and plastic tray products
- Aluminium and plastic pouch products
- Retortable cartons
- HDPE bottle products.