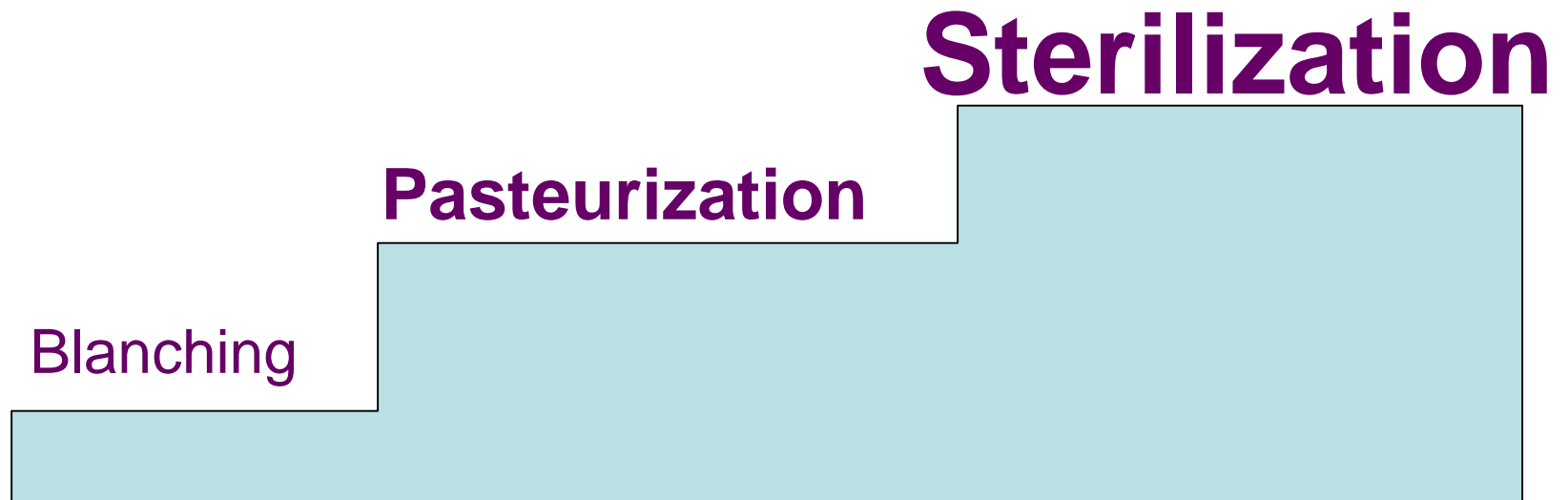


PASTEURIZATION

Summing up (What and Why?)



Major methods of heat processing

Pasteurization (What and Why?)

Pasteurization is the process of heating the product to a predetermined temperature and holding it until all or nearly all objectionable microorganisms, which may be present are killed.

(Developed by Louis Pasteur, 1960)

Purpose

- To make the product **safe** for human consumption by destroying the pathogenic organism which may be present.
- Improves **preservation quality** by destroying almost all spoilage organisms.
- Helps to **retain good flavor** over a longer period of time.

How?



Requirement	30 min	15 sec
Kill TB germ	138°F	158°F
Phosphate inactivation	142°F	160°F
Creamline reduction	146°F	162°F



Pasteurisation

How?

Requirement	30 min	15 sec
Kill TB germ	138°F	158°F
Phosphate inactivation	142°F	160°F
Pasteurization requirement	145°F (63°C)	161°F (72°C)
Creamline reduction	146°F	162°F

Pasteurization by heating and time treatments are a compromise among bacterial killing along with a number of other factors such as taste, phosphate inactivation, cream line reduction, etc.

Our enemy: *Micobacterium Tuberculosis*

How?

Methods of pasteurization

Methods	Treatment
Long hold batch type / Vat pasteurization	63°C-30 min
High temperature short time (HTST) pasteurization	72°C-15 s
Ultra high temperature (UHT) pasteurization	88°C-3 s

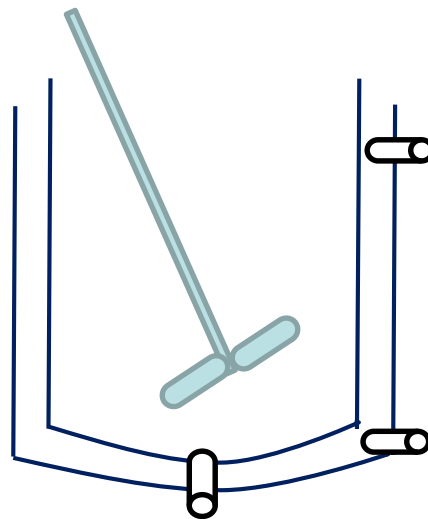
(Check the time and temperature combination in a dairy plant in your locality and see if they are really maintaining 72°C-15 sec or not. If there is a difference, find out the reason for the same.)

Long hold or Vat pasteurization

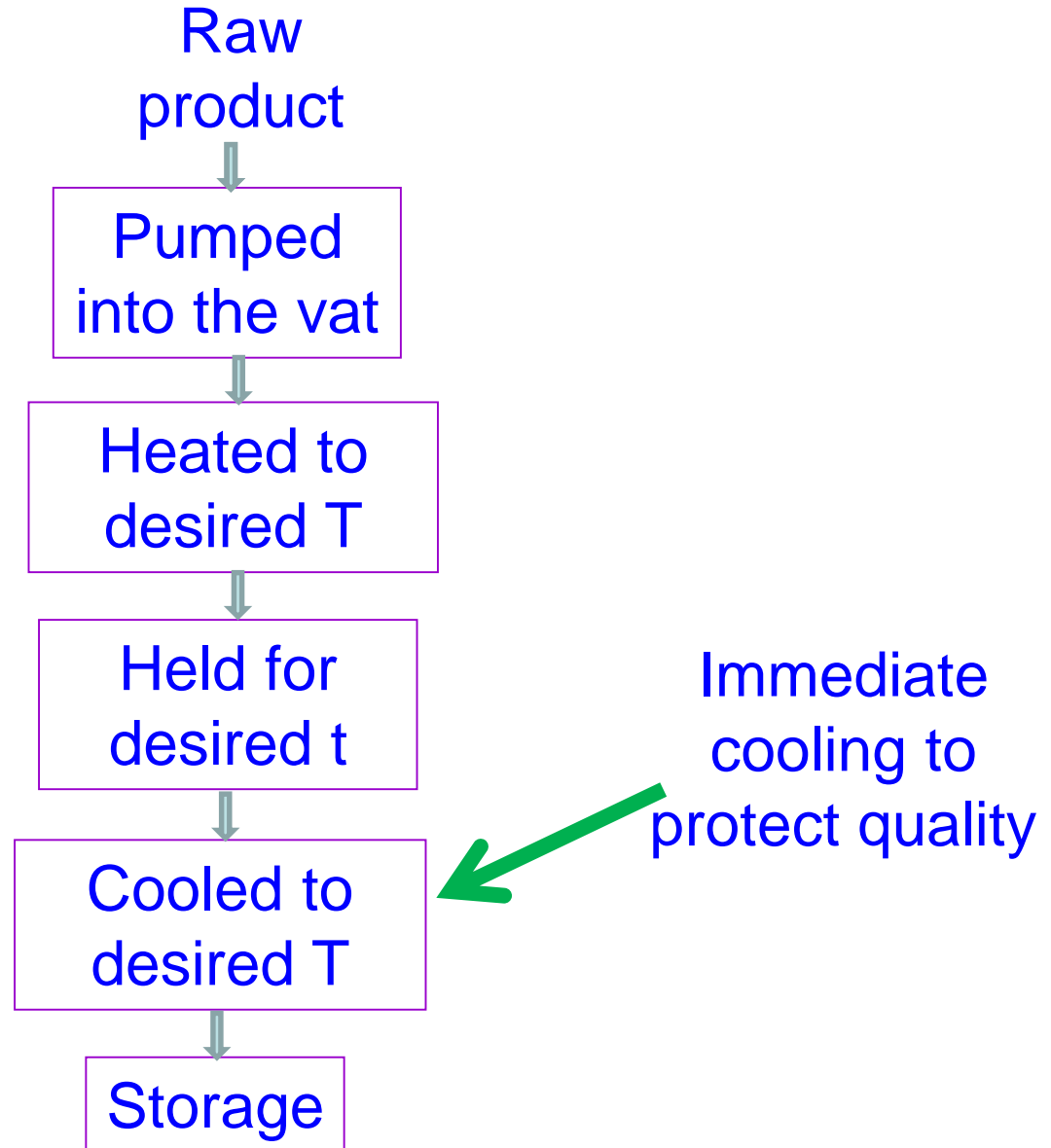
Types of vat pasteurizers

(Classification based on flow of heating medium)

1. Spray type
2. Flooded type
3. High velocity flooded type



Long hold or Vat pasteurization



Long hold or Vat pasteurisation

General requirements

- **Rapid heating:** Generally the circulation of heating medium can be started as soon as filling of the vat is begun, thus shortening the heating time.
- **Immediate Cooling:** In some designs the cold water is circulated over the outside of the inner lines as soon as the holding period is completed, so a part of cooling can be done in the vat itself.
- **Heating medium should be only a few degrees warmer than milk to prevent formation of milk stones on heating surfaces and cause minimum injury to cream line or flavour.**

Long hold or Vat pasteurisation

General requirements

Agitation

Agitation is easier in case of hot fluid than cold ones.

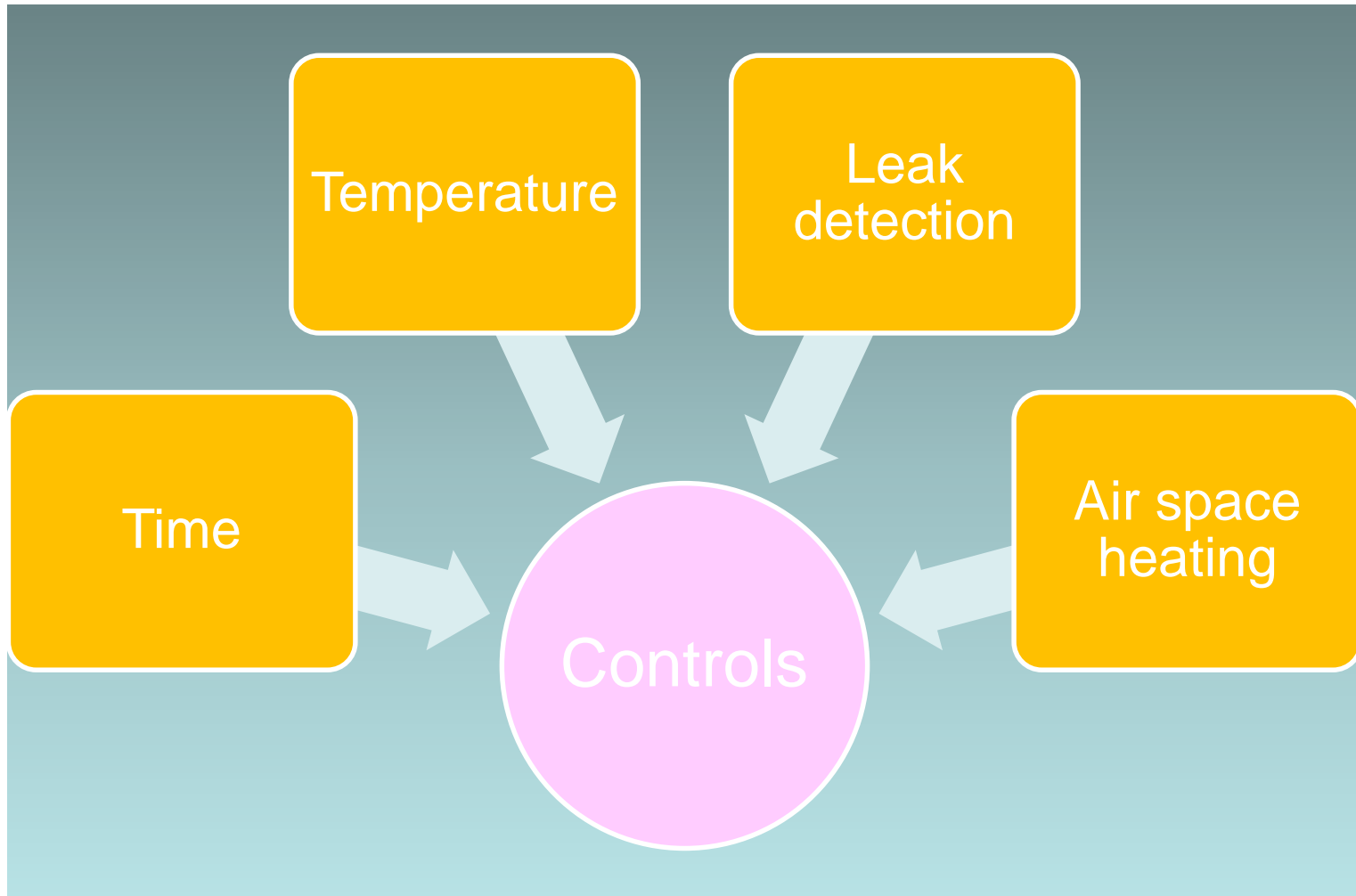
Agitation should not develop foam and it should not injure the cream line.

Viscosity of the fluid greatly affects the type of agitator.

Less viscous materials → Small dia high speed agitator

Highly viscous materials → Slow speed large surface blade

Long hold or Vat pasteurisation



Pasteuriser Controls

Vat pasteurization



- For vat pasteurizers, an electric or air operated control can be connected with a timing clock so that the heat is shut off when the proper milk temperature has been reached and a bell rings when the proper length of holding time has elapsed.
- Also temperature of heating water can be controlled during the holding period.

Long hold or Vat pasteurization

Advantages

- Well suited for small plants, low volume products
- Variety of products can be handled
- well suited for cultured products such as bottle milk, sour cream, etc.
- Simple, low installation cost

Disadvantages

- Batch type
- Slow process
- Manual controls → Constant attention
- Both heating and cooling are relatively expensive (as we do not have heat regeneration).

HTST pasteurization

Continuous flow systems using heat exchangers.

Generally plate type heat exchangers with regenerative heating, heating and cooling systems are used.

HTST pasteurization

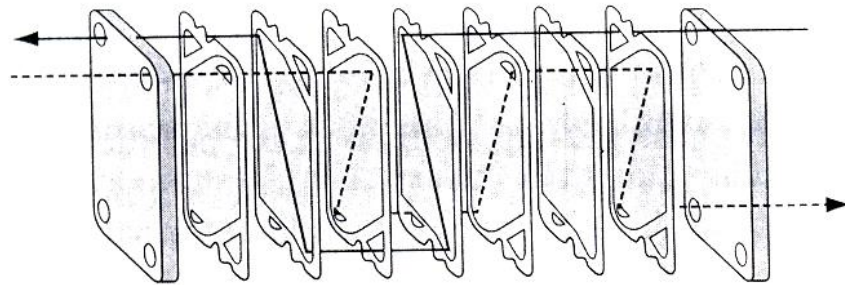
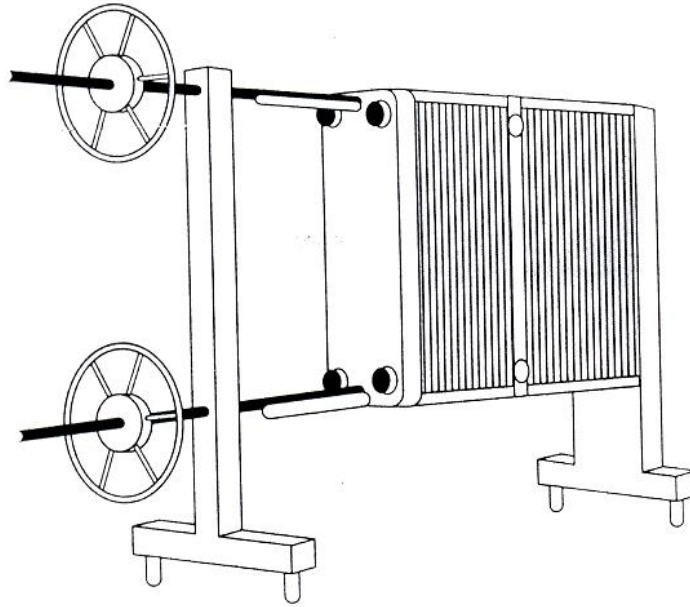
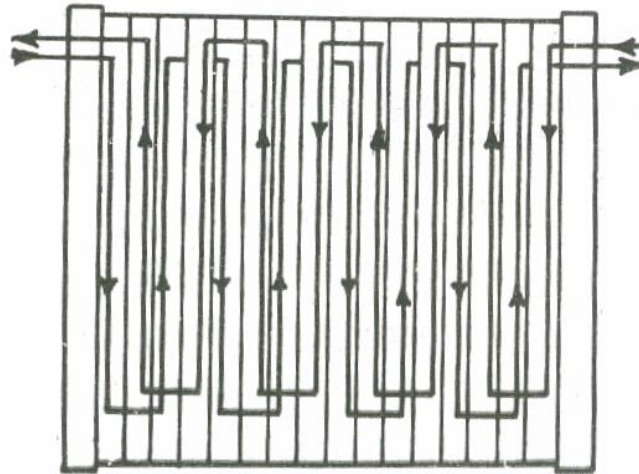
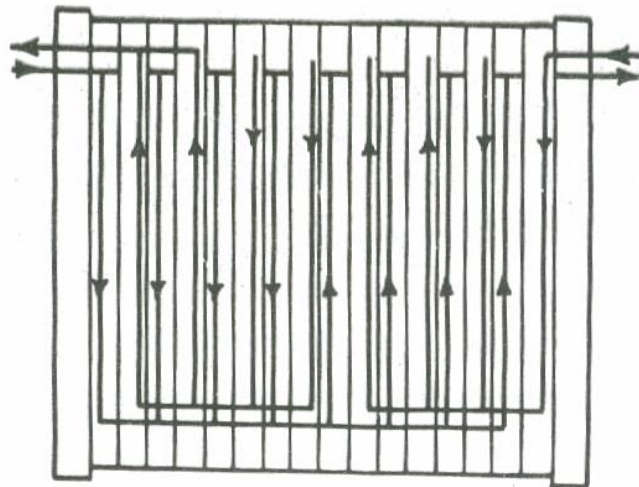


Plate heat exchanger

HTST pasteurization



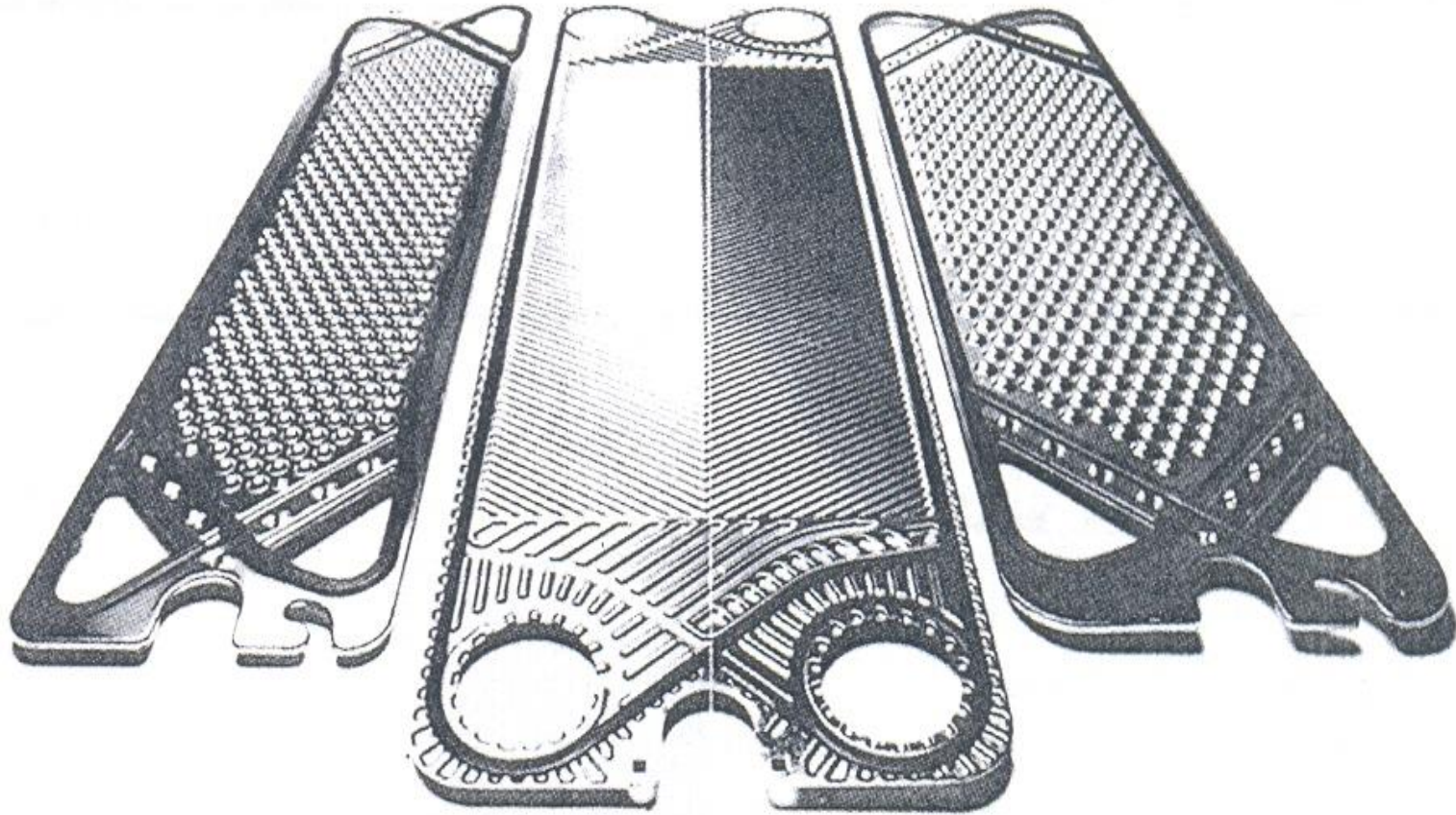
(a) single channel



(b) 4x2/ 2x4

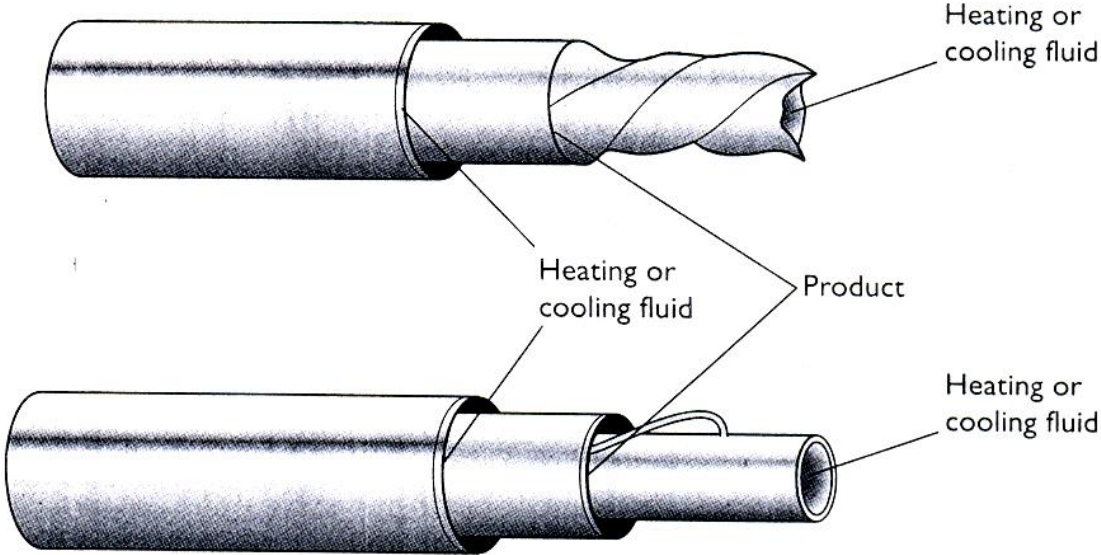
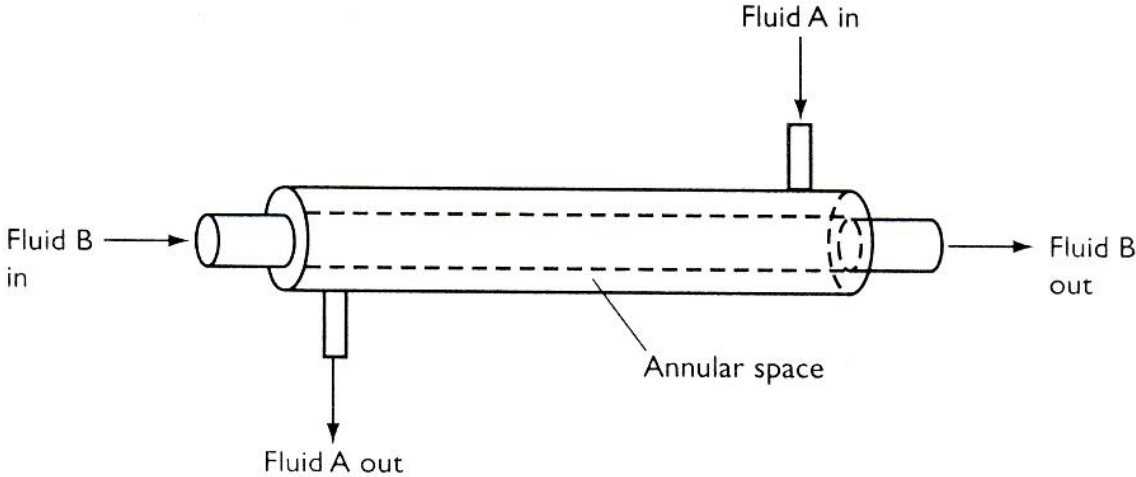
Flow pattern in plate heat exchangers

HTST pasteurization



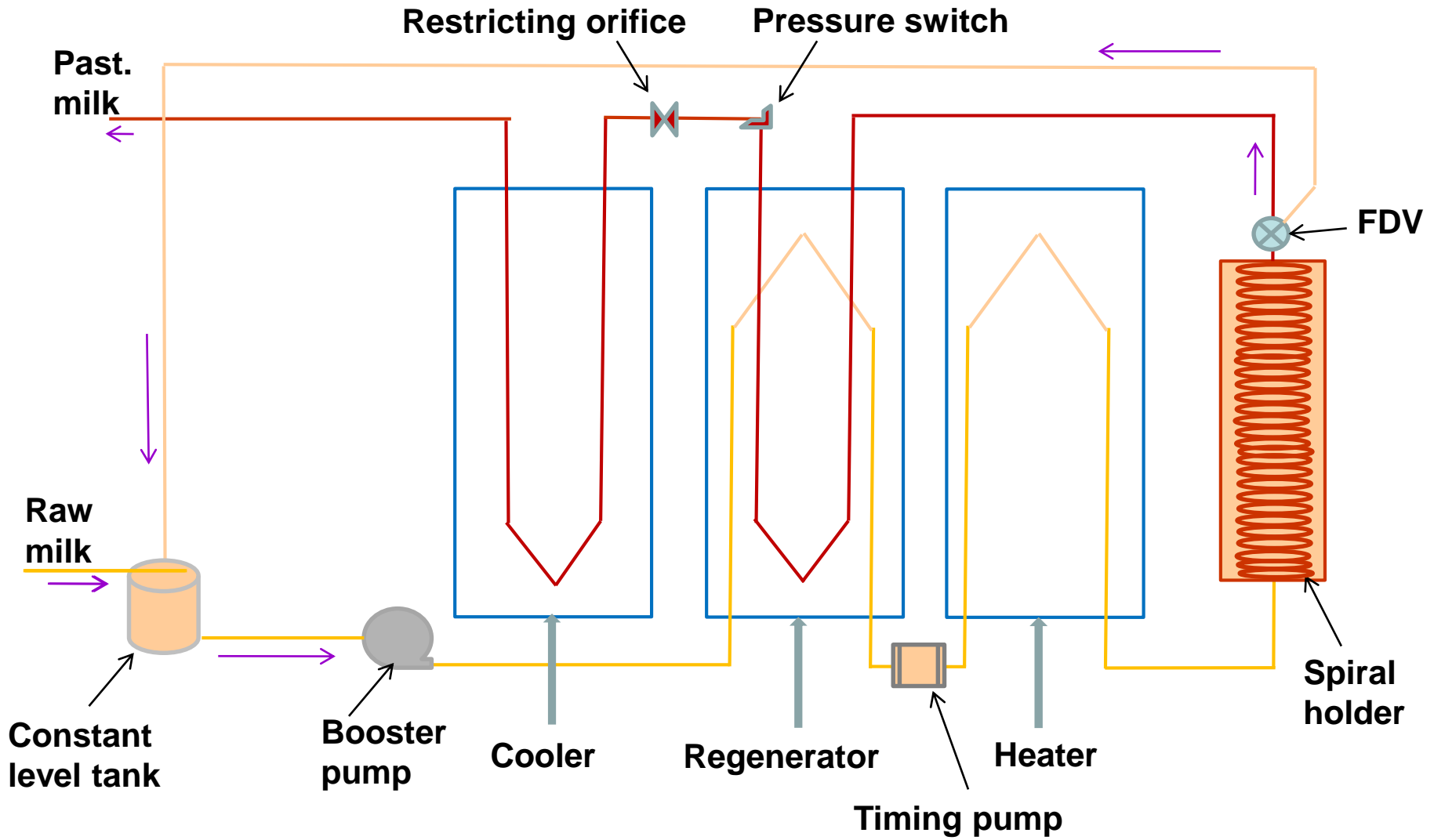
Types of plates used in plate type heat exchanger

HTST pasteurization- Can we use this ??



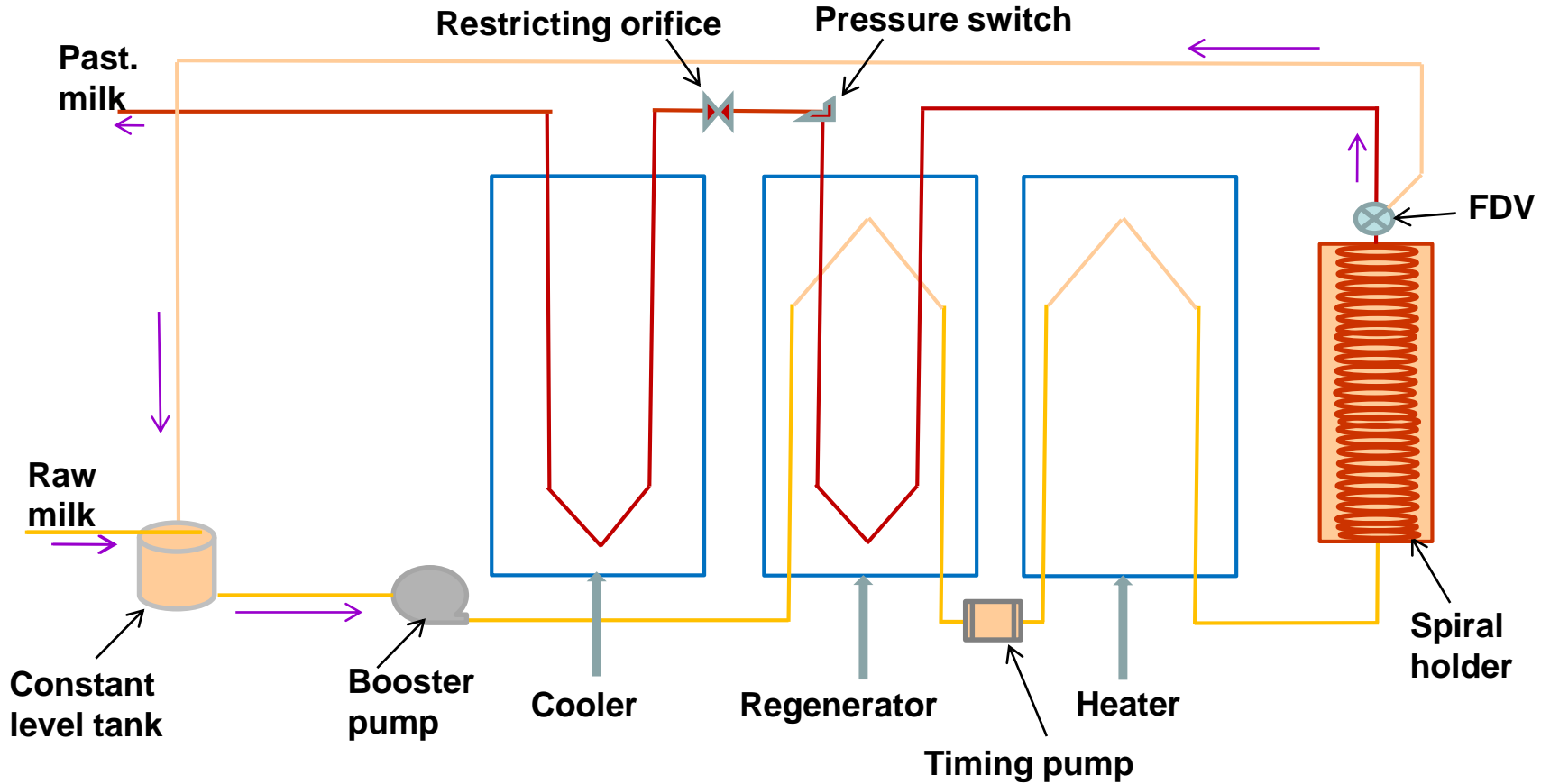
Tubular heat exchanger

Basic components of HTST pasteurization system



- In the regenerator it is heated to 60°C.
- Final cooling is done by cold water (0°C) to 4-5°C

HTST pasteurization- Controls



- *Flow rate*
- *Temperature*
- *Pressure*

Thank you