

MOBA

GRADING - PACKING - PROCESSING

OvoPro

PASTEURIZING



THE PARTNER FOR PROFIT

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Pasteurizing

To preserve any food product as long as possible it makes sense to eliminate as many micro organisms as possible. Many products can be sterilized at a high temperature for a very short time. The most commonly used sterilization methods are known as HTST (high temperature, short time) and UHT (Ultra-high temperature).

With egg products, too much heating will lead to a complete loss of the egg's functional properties and the egg products will literally be cooked. Sterilization is therefore impossible. A generally accepted method to eliminate harmful micro organisms like Salmonellae and to reduce micro organisms in general is called pasteurization. Pasteurization is named after Louis Pasteur who invented this process in 1862. The process consists of heating the product at a lower temperature, followed by maintaining this temperature for a longer time. Depending on the level of bacterial reduction, this will lead to a certain shelf life.

This reduction is usually expressed in a logarithmic scale. A log 4 reduction means that 99.99% of the bacteria are eliminated and a log 9 means a 99.999999% reduction. The higher the temperature and the longer the holding time, the higher the log reduction. For example: A colony of 1,000,000 organisms would be reduced to a single organism with a log 6 reduction.

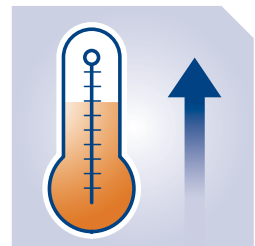
Over the last few years, pasteurization methods have been modified to not only eliminate pathogens, but also to focus on the preservation of the egg products' functional properties. All parameters that affect shelf life need to be coordinated optimally so that the actual pasteurizing step can be as gentle as possible. The result will be minimal impact on the functional properties. The lower the bacterial load of the input product, the lower the required impact from pasteurization. This will result in "minimally processed food".

Ideally, the pasteurization process is selected with the lowest possible time-temperature combination. This can still guarantee a salmonellae-free product and the best possible end product.

Heat Exchanging

OUR FOCUS

- Moba OvoPro recommends plate heat exchangers:
- Especially designed for eggs products
- Best capacity/volume ratio
- Best heat transfer ratio
- Specifically engineered to handle high and low viscosity products on the same system
- Super-small footprint compared to tubular heat exchangers
- Simple maintenance and easy inspection
- Saves cleaning time
- Low water + chemical usage for quick cleaning



Heat exchange plays a key role in egg processing. First the egg liquids need to be cooled as quickly as possible after breaking. Afterwards, they need to be properly heated when pasteurized. Cooling as well as heating is all about transferring heat from one medium to another. The medium used to heat up or cool down the egg products is water. In order to also save energy, the heat energy of the pasteurized product might also be used to heat up the raw product. This is known as heat recovery.

The interaction in all these situations is accomplished by the use of heat exchangers. They can be categorized into two different types: Tubular heat exchangers and plate heat exchangers.

Tubular heat exchangers consist of two or more tubes that are mounted inside each other. The raw product is fed through the inner tube and the heated water is in the tube surrounding it. There are also triple tube systems where the product is embedded with water on both sides. By making the hot water flow at a certain speed in the opposite direction, the product is heated evenly to the right temperature. This method of heat transfer is known as 'counter current flow'. Other common tubular heat exchangers are the single tube heated by an electrical current and the multi-tube heat exchanger that can be applied in the Moba OvoPro egg washer.

A plate heat exchanger consists of a number of corrugated plates. These plates are shaped in such a way that they create channels when they are stacked together. By placing

'The focus of the pasteurizing process should be on minimizing the loss of functional properties: Less is more.'

Plate heat exchanger

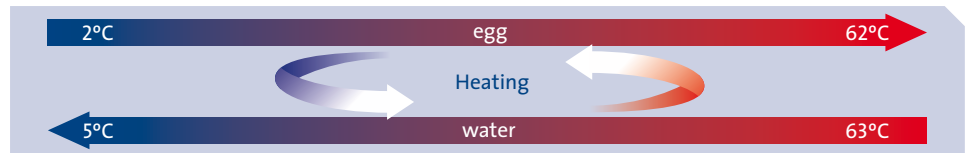


Dual tubular heat exchanger



different shaped gaskets between the plates, two different channels are created in the heat exchanger; one channel for the product and the other channel for hot water. Again, by making the hot water flow in the opposite direction of the product at a certain speed, the product is heated evenly to the right temperature.

Comparing the two different types with each other shows that using plates requires more specific knowledge about the process. At the same time however, plates create a much larger surface in a more compact footprint and carry a much smaller volume of liquids. They can be opened very easy for inspection and provide quick maintenance. Due to their smaller volume, they require less water to clean. Tubular heat exchangers have more specific applications in the egg-processing industry and Moba OvoPro can supply these upon request.



'A plate heat exchanger specifically designed for egg products offers better performance, efficiency and maintenance.'

One of the most important things in heat transfer is to be able to create proper turbulence in the product. It is absolute vital to properly distribute the heat throughout the product. In case of egg products, insufficiently distributed heat caused by bad turbulence will rapidly pollute the heat exchanger. This will eventually become totally clogged up with the coagulated ("cooked") egg product and will lead to insufficient pasteurization. Plate heat exchangers combine large surface with high turbulence. The result is excellent heat exchanging properties.

WE OFFER

- Capacities ranging from 600 to 20,000+ liters per hour
- Fast opening and closing for easy inspection, small footprint and economical cleaning
- Choice from four different plate options for product cooling as well as heating purposes
- Plates available in various sizes to specifically meet your requirements
- Non-adhesive, over-the-plate clip gasket system for easy removal or replacement
- Heavy-duty clips ensure that the gasket stays in place during handling and assembly.

Plate heat exchanger with tie bar frame



Moba OvoPro double plate heat exchanger with regeneration section



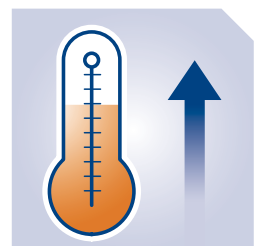
Three different high-efficiency plate heat exchanger frame options:

- Tie-bar frame heat exchanger frames:
 - When the assembly does not need opening every day
 - Low- cost heat exchanger configuration; plates are held together with 6-8 tie bars
 - Very suitable for high-pressure applications
- Single or double spindle frames allowing quick access for inspection and maintenance
- High end-frame with a hydraulic closer:
 - Equipped with two or four independent hydraulic rams
 - Special locking mechanism that releases the hydraulic pressure during normal operation
 - Can open or close within three minutes with a very limited number of moving parts

Heat recovery; regenerated heating and cooling

OUR FOCUS

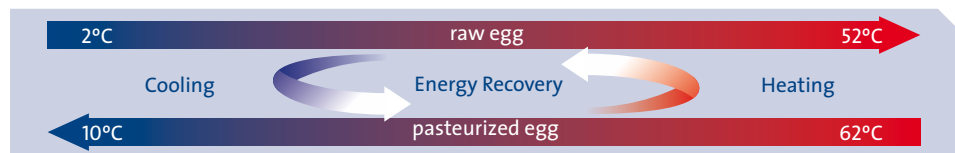
- Reducing production costs: save up to 90% in energy costs.
- Reliable and safe heat regeneration because of the use of the special double-walled plate regeneration section:
 - Use of pasteurized product to heat the raw product
 - Use of raw product to cool down the pasteurized product
- One unit to simultaneously heat and cool egg products



Pasteurizing in general requires a lot of energy. First you need to heat the raw product quickly to a specific temperature. After pasteurizing you need to cool down the product as soon as possible to get the best possible shelf life.

To make the pasteurizing process more efficient, it is possible to re-use the energy utilized in the process. The first heating stage of the raw product can be performed by using the heat from the pasteurized product. By doing so, the raw product is pre- heated, while the pasteurized product is pre-cooled during the same process.

'To prevent is better than to cure'



Direct regeneration

This heat-recovery method will reduce the amount of energy needed for both heating and cooling tremendously, making it a big money saver.

The most common method for regenerating heat is to use water as a transport medium. This is known as indirect regeneration. Safety is the major reason for using this method. Pasteurizing is all about food safety. This is why it is important that the raw product is never mixed with a pasteurized product. If a leak occurs in the heat exchanger, it would not be noticeable in the product, but only once the product is used. Needless to say, this is highly undesirable.

Using water as the transfer medium enables you to notice almost immediately if the water is mixed with the product, for example by the color. This is a very quick indication that your pasteurizing process is no longer reliable.

The ability to detect a leak in the pasteurizer as soon as possible is absolutely vital in food processing.

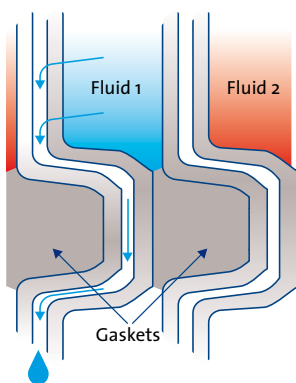
In addition to indirect regeneration, there is also the possibility to use the raw product for direct cooling of the pasteurized product and vice versa. This method is known as direct regeneration. The fact that there is no transfer between product and medium makes this procedure far more efficient than indirect regeneration.

This procedure however would only be safe if a leak can be detected quickly at all times.

The special Moba OvoPro regeneration sections allow just that: Safe direct regeneration.

The regeneration section of the Moba OvoPro plate-heat exchanger is equipped with double-walled plates that transfer heat safely from the pasteurized product to the raw product. This feature prevents contamination from a pasteurized product. If incidental leakage occurs, the product will leak out between the double plates and the operator will spot it immediately.

If one of the plates has a leak, the other plate will still prevent contamination. This is another very important element. The potential danger is observable and can be repaired after the production run, way before any contamination can take place.



A leak shows immediately on the outside

Shock

**WE OFFER**

- Most efficient direct heat-regeneration method; saves more than 90% in energy costs compared to other indirect systems
- 100% safe direct regeneration by special double-walled regeneration section
- Indication and repair of potential leaks before contamination can take place

Final Heating

OUR FOCUS

- Precise heating up to perfect pasteurizing temperatures is the unique link between shelf life and properties
- Using the Shock to heat the product without loss of functional properties

After heating the raw product to a certain temperature, hot water is used to get the product to the precise temperature. This is done in the final heating section of the heat exchanger. The final stage in heating the raw product determines at what temperature the product will be maintained for proper pasteurizing.

It is important to realize that proper pasteurizing not only depends on temperature, but also on the time the product needs to be maintained at that temperature. Choosing the right time-temperature combination determines the level of final heating. Moba OvoPro's philosophy makes it a leader in this field: minimizing the required pasteurization by paying extra attention to the preceding steps in the process. Moba OvoPro has two different ways of carrying out final heating:

- Through hot water by the heat exchanger
- Through a combination hot water by a heat exchanger and the Shock

WE OFFER

- Lowest possible impact during pasteurization resulting in the best functional properties
- Utmost efficient heating resulting in saving energy costs
- Possibility to combine homogenizing and final heating with the Shock

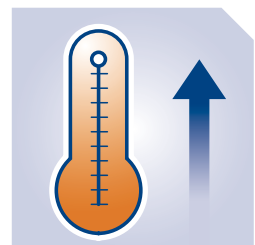


Plate heat exchanger, shock and holding tubes



Shock



OUR FOCUS

- Allows pasteurization at high temperatures for extended periods of time without cleaning
- Accurate final heating without surface-to-surface heat exchange
- Produces a superior homogenized product with the best functional properties
- Saves energy, water, chemicals and labor
- Cavitation process contributes to a lower bacterial load
- Easy to integrate into your existing pasteurizing equipment

The Shock is a non-contact homogenizing and heating action, based on cavitation. This is induced into the liquid by a very fast-spinning special rotor. The special shape of the rotor, in combination with the high speed, creates vacuum bubbles. This is the same effect as bubbles created by a propeller of a boat in the water. These bubbles implode immediately, releasing energy from the implosions, which is transferred into the liquid by means of a shock wave. This causes the liquid to homogenize in the best possible way, without damaging its functional properties.

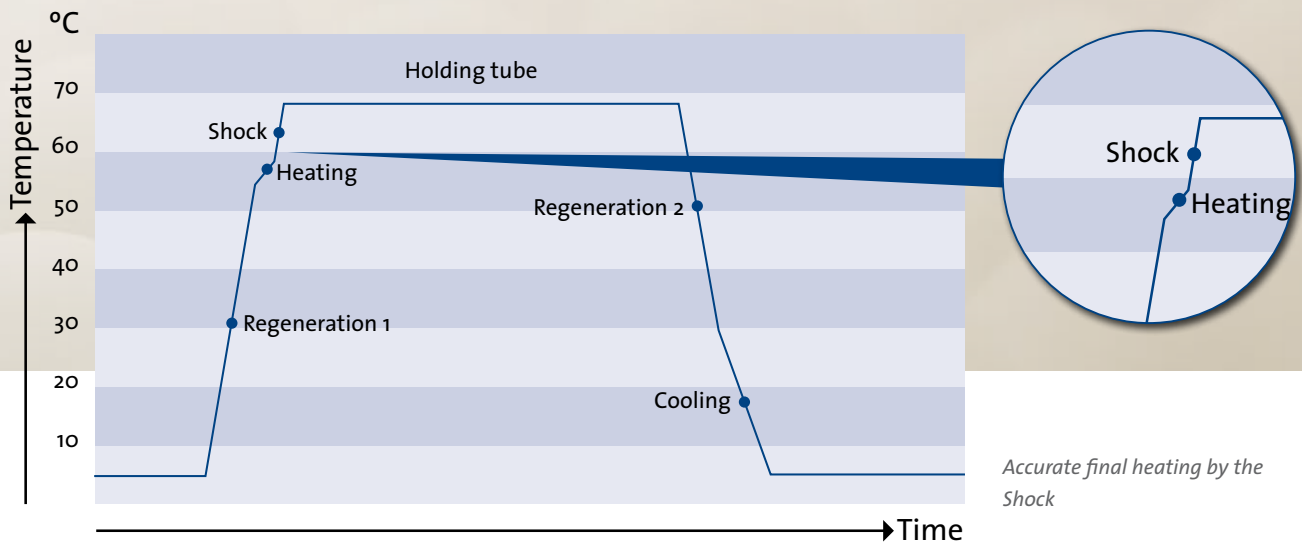
As a result of the intense shock waves, the liquid egg product is also heated. The heating happens very evenly, efficiently and accurately up to 18°F (10°C). The system applies direct heat to liquids without the use of a heat-transfer surface.

The temperature rises without affecting the carbon bonds of the proteins. This allows you to pasteurize at higher temperature, creating an extended shelf life without loss of functional properties.

Foaming and baking tests have shown that products that are pasteurized and homogenized by the Shock perform better.

WE OFFER

- Pasteurization at higher temperatures without damaging the product's functional properties
- Increased shelf life with maintained functional properties
- Combined homogenizing with perfect final heating of the product



Holding

OUR FOCUS

- Fully-insulated holding tubes result in the smallest temperature loss in the industry
- A sloped design prevents air pockets from getting trapped inside
- Special corrugations in the holding tube to induce turbulence for perfect pasteurization results



Pasteurizing is heating the product to a pre-determined temperature for a pre-determined period of time. The relation between the time and temperature leads to a certain shelf life of the pasteurized product.

The correct time-temperature combination for a specific product is determined by the use of thermal destruction charts. If a treatment does not result in the desired shelf life, it is advisable not to increase the temperature. This might be the first thing that comes to mind, since higher temperatures destroy micro organisms more easily. However, increasing temperature will have an immediate effect on the functional properties of your end product.

The correct method is to increase the holding time. Increasing holding time will have a less severe effect on the functional properties than a higher temperature. This is only possible if the holding tube system is designed in the correct way.

The holding tubes need to have a certain length to be able to handle the time required for proper pasteurizing. What happens here is that the egg product flows non-stop through the holding section, while holding is in progress.

Since a certain temperature level is essential for proper pasteurizing, it is vital that the holding section is capable of maintaining this temperature as stable as possible. To achieve this, the holding tubes will require proper insulation.

Another very important property for every holding tube is to maintain turbulence in the product throughout the tubes. If there is no proper turbulence created inside the holding section, there is a risk of 'channeling' the product. This means that separated flows within the stream can develop. These flows travel at a different speed than the main stream, and will therefore have an effect on the overall holding time. This in turn will affect the shelf life and the product's functional properties.

Sloped insulated holding tubes

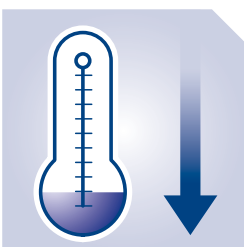


Finally, the third very important feature is to be able to prevent air pockets from being trapped inside the holding section. Air pockets can affect the proper flow of the product, resulting in an incorrect holding time. It is also important that any remaining water from cleaning can be drained off effortlessly from the tubes, since mixing water with the product is of course undesirable.

WE OFFER

- A unique sloped design for the holding tubes:
 - Reduces product loss during transitions
 - Reduces the amount of water that mixes with product after cleaning
 - No trapped air pockets that affect the holding times
- Corrugated tubes that guarantee the proper and constant holding times at the right temperature
- Holding systems from 2.5 to 7.0 minutes, depending on the time-temperature combination for the required pasteurization (and expected Log reduction)
- Pressure differential controls and single or dual divert valve assemblies
- USDA/3-A™ approval
- Automatic or semi-automatic controls:
 - Chart recorder to be able to see the course of temperature of the process instantly
 - VF-drives for the pumps the always create a constant flow
 - Automatic hot water controller
 - Optional PLC control with touch screen
 - Optional ethernet adapter to be able to link up to an external computer system

Final cooling



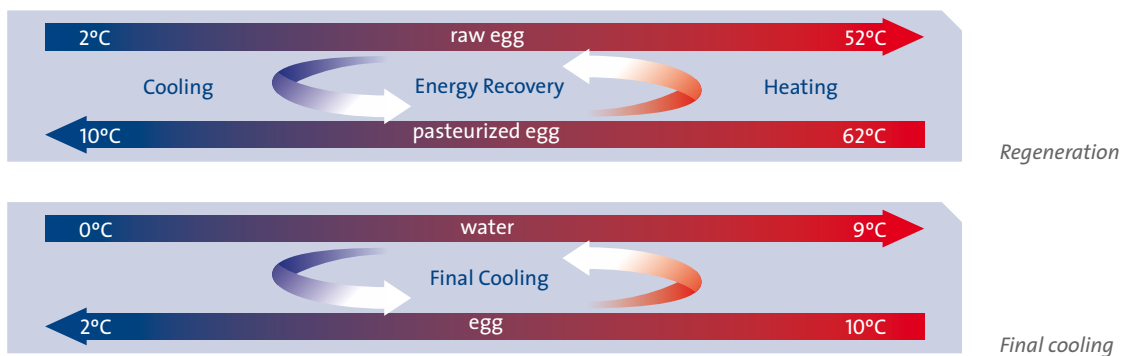
OUR FOCUS

- Cooling and final cooling are combined in a single heat exchanger
- Cool down as quickly as possible after pasteurizing
- Filling and packaging as soon as possible after final cooling

When the pasteurized product leaves the holding tubes it will travel back to regeneration section of the heat exchanger, where it is used to pre-heat raw product.

After the regeneration phase, the product needs to be cooled down to the proper storing temperature. This cooling stage takes place in the cooling part of the heat exchanger. Chilled water is led along the pre-cooled product.

Again, the best and most accurate cooling performance is obtained by using the 'counter current flow' transfer. At the end of the final cooling section, the product is cooled evenly



to 4°C or lower.

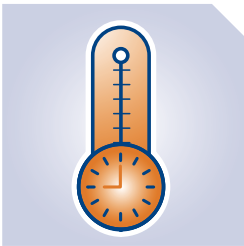
To keep contamination at lowest possible level, it is important to avoid any further actions as much as possible. This means no further stirring or blending at this stage. The internal transport of the cooled pasteurized product also needs to be kept to a minimum.

Ideally, the pasteurized product should be stored in containers in which it will be transported from the processing plant. This means that filling has to be carried out before the product is stored in the refrigeration room.

WE OFFER

- Exchanger concept with lowest energy consumption
- Combined cooling and final cooling concept that is flexible, easy to maintain and clean and is most cost-effective

Hot room



OUR FOCUS

- Accurate control of humidity and temperature to determine product properties
- Proper airflow design, which is vital
- Constant monitoring + control to save energy and create better products

Albumen is spray dried in unpasteurized form because this is the best method for preserving its functional properties. After a powder is created, it is pasteurized by storing it in 'hot room', a storage room where the powder is stored between two and three weeks at temperatures varying between 60°C / 122°F and 70°C / 158°F. Hot rooms cannot be used for whole egg and yolk powders. These products contain fat and the powders would turn rancid (like butter). Exact procedures in hot rooms are often considered company secrets. The combination of temperature and humidity is vital. If the humidity is too high, the powder will contain too much water with a high risk of bacterial growth and consequently a shorter shelf life. On the other hand, too low humidity will affect solvability of the powder. By adjusting these parameters, the hot room can be used to create egg white powders with specific properties. Depending on the above settings, the powder product can be adapted to one of the specific applications below:

- Standard
- High- whip
- High-gel

WE OFFER

- Moba OvoPro helps you specify your building requirements, supplies the heaters and integrates the hot room into a complete plant operating process.

For worldwide offices and agents' network, please look at www.moba.nl

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