



Validation of pasteurization and sterilization

simple and
effective
temperature
and humidity
monitoring



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INTRODUCTION

Bacteria can be extremely useful. They are used in the production of cheese, yoghurt, beer and wine. However, in excess, and depending on the type of bacteria or micro-organisms they can be very harmful.

Being impossible to achieve total elimination of bacteria and micro-organisms in a product, it is desirable that they are reduced to acceptable levels, in the case of food products and pharmaceuticals. That is the purpose of the heat treatments such as sterilization or pasteurization.

One of the difficulties to validate such processes is the measurement of temperature at a significant sample of the process. Measurements on the equipment do not always match the actual temperature, for example, inside a can of food, a package or in the centre of a ham.



APPLICATIONS

- Caned food industry
- Dairy industry
- Laboratories
- Pharmaceutical industry

PASTEURIZATION

Exposure to high temperatures is a process relatively easy to obtain but, depending on the product, can mean the deterioration of characteristics such as flavor, texture and even by altering the composition of ingredients at high temperatures.

The most usual method for eliminating pathogenic elements is the Pasteurization (named from its inventor Louis Pasteur). The designation used to quantify the pasteurization is the Pasteurization Unit.

The Pasteurization Unit is defined as the heating to a temperature of 60°C for 1 minute. The amount of PU to apply to a product depends largely on the type of product, which bacteria are to be eliminated, the packaging and conservation period to achieve.

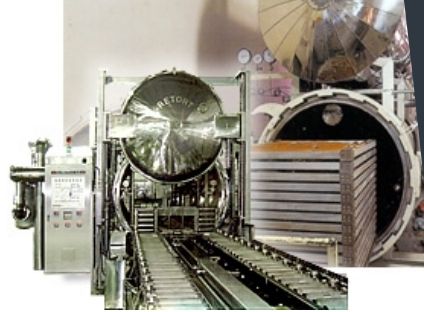
The calculation of Pasteurization Units is obtained by placing the Thermochron or iBTag logger within the process. The software ExpressThermo then calculates the value of Pasteurization Units obtained affected by the user imputed parameters.

T_{ref} – Reference temperature

T_{min} – Minimum temperature (temperature below which there is no contribution for Pasteurization)

Z – Temperature change required to reduce bacteria count by a factor of 10





STERELIZATION

In medical and pharmaceutical applications and even in some processes of the food industry, the objective is to totally eliminate bacteria, viruses, spores and other micro-organisms that cause infections or diseases.

The Sterilization Unit (F_0) is defined as the heating to a temperature of $121,111^\circ\text{C}$ for 1 minute. The amount of F_0 to apply to a product depends on the amount of thermal destruction of micro-organisms that is required.

The calculation of Sterilization Units is obtained by placing the Thermochron logger within the process. The software ExpressThermo then calculates the value of Sterilization Units obtained affected by the user imputed parameters.

T_{ref} – Reference temperature

T_{min} – Minimum temperature (temperature bellow which there is no contribution to Sterelization)

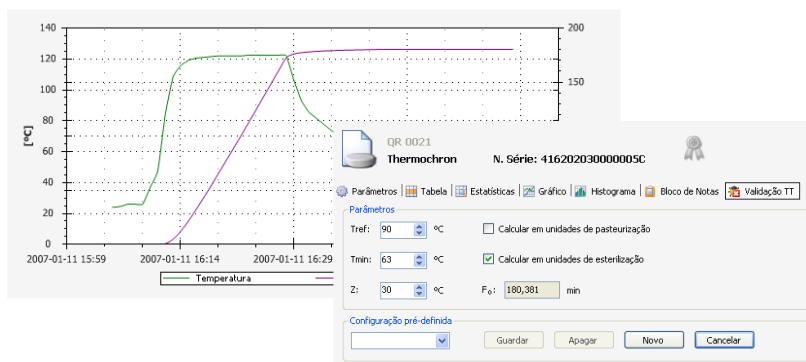
Z – Temperature variation required to reduce the bacteria count by a factor of 10

CONCLUSION

A major advantage of using the units of pasteurisation or sterilization is to compare variations of that process.

For example, for the pasteurization of milk intended to heat the milk to 63°C for 30 minutes and, from these figures, it calculated the value of the PU to obtain. During the actual implementation of this process will, of course, occur variations in temperature, the speed of heating and cooling and even the duration of treatment. Using a Thermochron, or an iBTag, one can assess the PUs obtained and compared with the required value.

It should be noted that the calculation of Pasteurization (or Sterilization) Units is a mathematical model and provides a theoretical value. It is important to make periodic verifications to the process through bacteriological analyses of processed products.



TEMPERATURE

Exact temperature measurement **within** the process.



TIME

Accurate monitoring of the process duration.



WIRELESS

Thermochron and iBTag loggers work without any wired connection thus not interfering with the process and eliminating complex setup operation.



ANALYSIS AND REPORTS

ExpressThermo software shows the heat treatment curve for analysis and a report of the process can be generated for documentation purposes.

ECLO

Eclo it's a technological Portuguese company leader in R&D+i of systems for the agro-food industry. Their equipment and solution offers are divided in three main areas:

- Temperature and humidity monitoring systems based in the Thermochron, Hygrochron and iBTag loggers and ExpressThermo software;
- Traceability information management system for the agro-food industry: ExpressTrace;
- Monitoring system for concrete maturity.

Besides the standard off-the-shelf solutions, Eclo has the capability and know-how to develop turnkey projects. The most demanding project to date in our custom solutions portfolio was a logistic tool for the largest Argentinean fruit exporter. The system manages temperature, humidity and operational information for their daily operations by road and sea.

Eclo maintains a technological and strategic partnership with Maxim Integrated Products, Inc. — manufacturer of the Thermochron and Hygrochron — and develops all the system to use the loggers. It's the only company in the Iberia Zone that working with this loggers with Authorized Solutions Developer status granted by Maxim, Inc.



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