JBT®

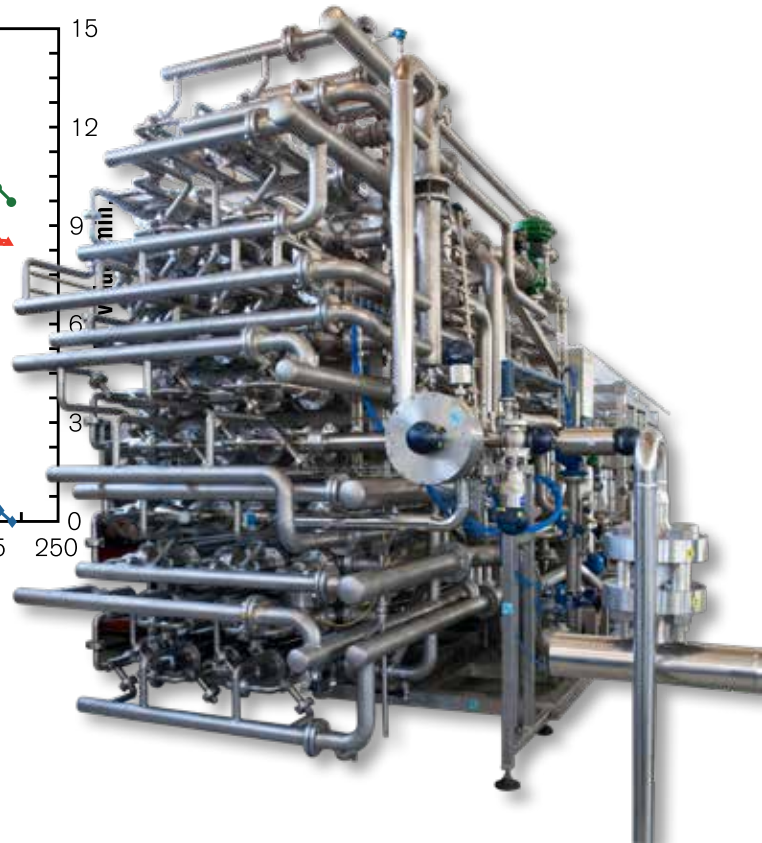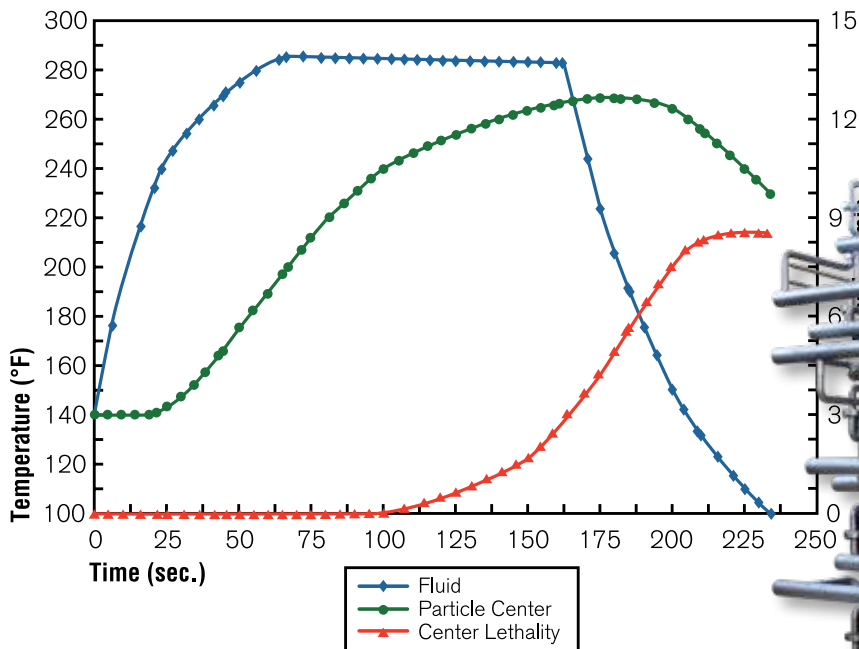# AseptiCAL™
Mathematical Modeling Software

Predicts the temperature of the fastest moving particle in an aseptic processing system
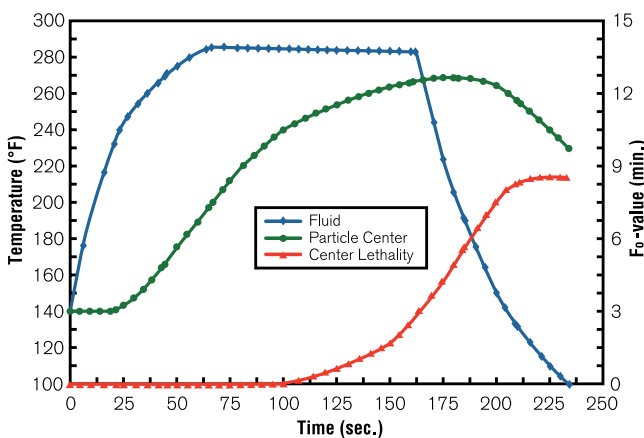
ASEPTIC SYSTEMS

General Description

AseptiCAL™ software is an advanced finite difference based mathematical modeling package for aseptic process development of low acid and high acid foods with or without discrete particulates. The program is divided into four modules to accommodate 3-D Particulates, 2-D Particulates, 1-D Particulates and Homogenous Products.

AseptiCAL™ calculates:

1. The "worst" case particulate F^Z_{Tref} value
2. Cook value and integrated lethality (F_S value)
3. The hold tube length
4. The product volume flow rate
5. The product process temperature.

AseptiCAL™ simulated center temperatures of the fastest moving particle and its accumulated lethality values in a typical aseptic process for multiphase foods:

- Modeling various geometry of food particles, such as 3-D slab, cylindrical, spherical and other odd geometry

- Calculate the "worst" case particulate, F^Z_{Tref} value & Log Reduction number

- Calculate the hold tube length for a scheduled F_0 value
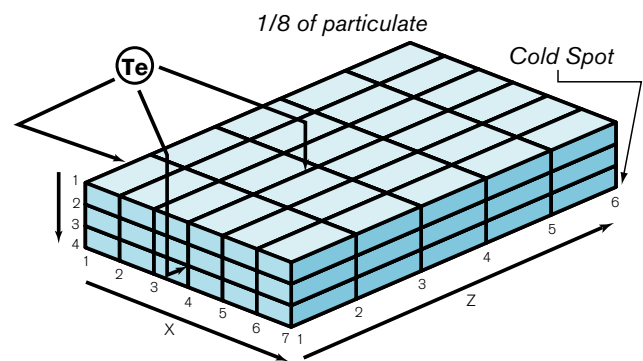
1/8 of particulate

PRODUCT FEATURE	PROCESSOR BENEFIT
Predicts the temperature of the fastest moving particle in an aseptic processing system	Simulation with an accurate model is a requirement for filing low acid particulate process with FDA
Predicts the temperature of the fastest moving particle in an aseptic processing system	Verifies the sizing calculations of the aseptic processing system and reduces the time in new product development during the research stage
Calculates the hold tube length for a scheduled F_0-value	Reduces production costs in the event of a deviation by analyzing product holds safely and accurately
Optimizes the aseptic processing time and temperature	Can be applied to product quality, operational expenses and throughput

AseptiCAL™ DELIVERS ACCURACY AND SAFETY						
Process	Hold Tube		Whole System			Spoilage by
Temp	F^{20}_{250}	ISV	F^{20}_{250}	ISV	LCR	PA 3679
282.3	3.94	6.39	10.29	11.92	9.17	No (LCR>5)
279.2	3.17	5.42	8.03	9.54	7.34	No (LCR>5)
269.9	1.63	3.30	3.78	4.93	3.79	Positive
263.3	1.03	2.33	2.23	3.15	2.42	Positive
253.5	0.52	1.37	1.03	1.66	1.28	Positive

AseptiCAL™ calculations vs. biological validation

POSITION	REQUIRED (°F)	AseptiCAL™
Enter Heating SSHE 1	140.0	140.00
Enter Heating SSHE 2	240.0	240.10
Enter Heating SSHE 3	270.0	269.99
Enter Hold Tube	285.3	285.21
Enter Cooling SSHE 1	282.3	282.40
Enter Cooling SSHE 2	189.8	189.54
Enter Cooling SSHE 3	132.7	132.37
Enter Cooling SSHE	99.5	99.65

Required temperatures vs. AseptiCAL™ predicted temperatures at various stages of an aseptic processing system

Modelling of the sterilizing effect calculation

Processors often tend to over-estimate the sterilizing effect in an effort to guarantee Food Safety.

AseptiCAL was designed for the purpose of helping Food Authorities and Scientists validate and develop the proper implementation of thermal treatments.

This tool provides the calculation software for on-line modeling of liquid product thermal treatment during pasteurization or sterilization process as well as the ability to calculate the sterilizing effect applied.

Off-line modeling is also used to define the treatment to be applied to particulate pieces, thus guaranteeing the desired sterilization effect at the particulate core.

The off-line program can model different geometries of food particles calculating the most unfavorable situation and predicting the correct holding tube length for the expected sterilizing effect.

The AseptiCAL program has been accepted by the US Food and Drug Administration.

Heating   Holding   Cooling

100°F   281.0°F   280.0°F   101°F
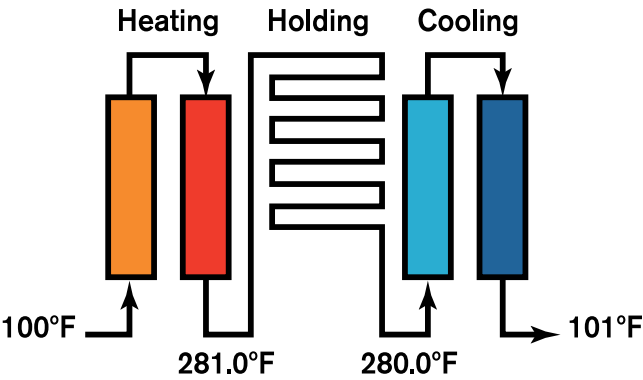
F_0 on-line calculation

Thermal lethality is calculated real-time during heating and holding.

PLC   Comulated F_0 T_2 T_3 T_4

T_1

T_0

Δt_0 Δt_1 Δt_2 Δt_3

Flowmeter
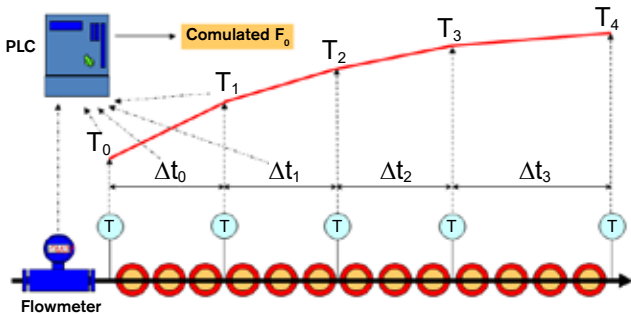
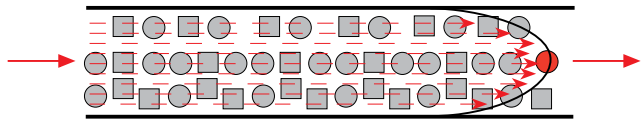## Thermal Process:

- Heat process from media to liquid
- Heat process from liquid to particle (surface)
- Heat process within the particle
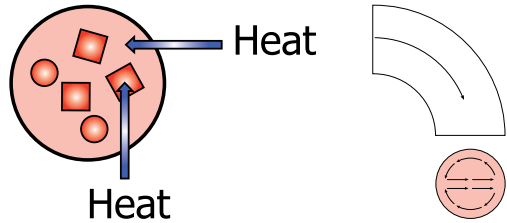
Heat   **Heat**

Presence of particulates is challenging for lethality evaluation:
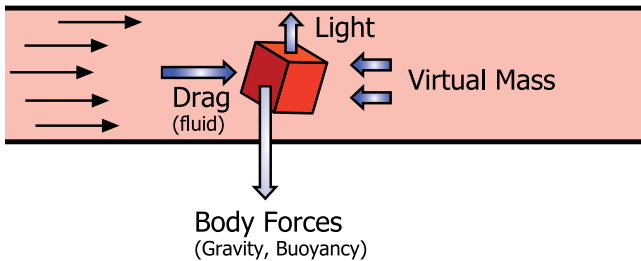- modeling heat transfer in particulates
- modeling particle motion

Task:

Identify the slowest heating zone of the fastest moving particle.

Residence time distribution study of particle movement is a computationally intense task.

Different Particle Shapes

Light   **Virtual Mass**   **Drag** (fluid)   **Body Forces** (Gravity, Buoyancy)

JBT Parma pilot plant uses AseptiCal for each sterilization test that involve fruit and vegetable dices suspended in a liquid medium. The sterilizer is designed to measure and record all the data (temperature and flowrate) necessaries to run Aseptical.

The tests done for customers in the pilot plant are completed with a report where are showed all the input and output values obtained with this software: for example the F value in the center of the fastest particle.

COUNT ON JBT TO HELP PROTECT YOUR INVESTMENT

JBT's greatest value in PRoCARE® services comes from preventing unexpected costs through smart, purposeful, and timely maintenance based on unmatched knowledge and expertise. PRoCARE service packages are offered as a maintenance agreement in various service levels, depending on your production and cost management requirements.

JBT DIVERSIFIED FOOD & HEALTH

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