

STUDY OF HEAT PENETRATION IN CANNED FISH

Aim: To determine the rate of heat penetrations in canned food and to draw the heating- cooling curve.

Introduction: The rate of heat penetration at the slowest heating point in canned foods is used in the scientific evaluation of thermal processes and also in formulating sterilization processes for new products. The experiment, when conducted on low acid canned foods processed in retorts under pressure, requires special equipments. But in the case of fruit cans it can be simplified by the use of thermometers inserted into canned foods, heated in water. The method described in this experiment is a simple one, though subjects to certain errors.

Material and Equipments:

Canned fish with can body containing a hole, heat penetration test assembly, retort, section paper and materials for drawing graphs etc.

Heat Penetration Test Assembly:

The heat penetration test assembly used for heat penetration study mainly consists of the following units.

- 1) Standard Copper constantan thermocouples insulated by nylon tubing which could be screwed on to the thermocouple receptacles, and having pencil like pointed ends.
- 2) Thermocouple receptacles that could be fitted to the can body tightly with the help of packing glands and rubber washers.
- 3) Thermocouple lead wires of sufficient length, to be brought out of the autoclave and connected to a temperature reading instrument, through a junction box that can take 10 couples simultaneously.
- 4) An automatic self-compensated, digital thermometer, with a reading accuracy of 0.1°C in the range of 60° to 200°C for temperature reading.

Procedure:

- ☞ Fix the thermocouple of the assembly unit into a seamed can packed with fish in such a manner that the position of tip being located at the point of greatest temperature lag. For

solid or very viscous packs, which heat mainly by conduction, this point is usually taken as the geometric center of the can.

- ☞ Make the hole on the can body air tight, through which thermocouple enters by using packing glands and rubber washers.
- ☞ Keep the thermocouple – inserted seamed cans inside the autoclave (retort), with the thermocouple lead wires coming out of the autoclave and later close the retort.
- ☞ Connect the thermocouple lead wires to the temperature reading instrument
- ☞ Note the initial temperature of the cans when placed in the retort.
- ☞ Start the stopwatch as soon as the cans are placed in the retort.
- ☞ Raise the temperature of the retort through steam generation and record the temperature for every 5 minutes.
- ☞ Maintain the temperature used for processing by adjusting the rate of steam generation.
- ☞ Give the intended thermal process time i.e. 70 minutes at 111.5°C (10 psi)
- ☞ At the end of processing time, stop steam generation and allow the temperature of the retort to come down to 100°C (0 psi)
- ☞ Quickly take out the cans along with the thermocouple and cool the cans by immersing in a vessel, under running water.
- ☞ Continue to note the temperature during cooling phase, till the temperature reaches 40°C or less.
- ☞ Based on the observations recorded, draw the heating and cooling curve and find the come-up-time, processing time and cooling time.

Note:

Come-up-Time: Time taken in minutes by the retort to reach the required processing temperature.

Processing time: Time in minutes for which the canned fish is exposed to actual processing temperature.

Cooling Time: Time taken in minutes to cool the canned fish to a temperature of 40°C , after the process time ends.

Observations:

Can Size :
Canned fish products selected :
Retort temperature :
Come up time (min.) :
Processing time (min.) :
Cooling time (min.) :

Tabulation:

Time (minutes)	Can center temperature (°C)			Retort temperature (°C)	Remarks
	Can I	Can II	<i>Can III</i>		
Heating					
0					
5					
10					
15					
20					
“					
Cooling					
0					
5					
10					
15					
20					