CANNED PET FOOD:
from formulation to production

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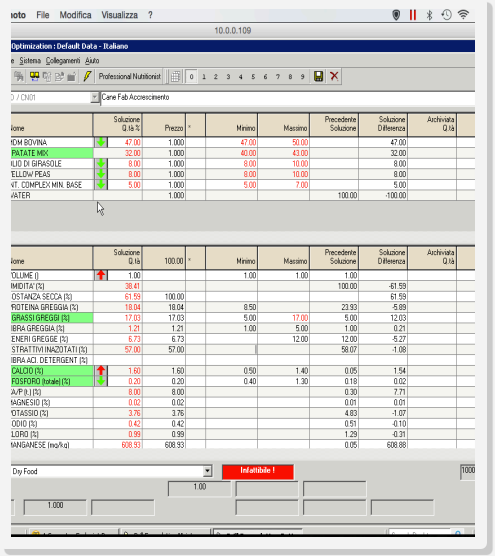
ESVCN

RESIDENCY
CLASS 2017

CANNED PET FOOD DEVELOPMENT

A

FORMULATION



B

THERMAL PROCESSING

PALATABILITY

C

LABELLING

D

CANNED PETFOOD FORMULATION

COMMERCIAL UE PET FOOD MUST BE FORMULATED WITH THE AVAILABLE **INGREDIENTS** DEFINED IN THE **CATALOGUE OF FEED MATERIALS** + ONLINE WEBSITE ***WWW.FEEDMATERIALSREGISTER.EU***

L 159/48 EN Official Journal of the European Union 21.6.2017

COMMISSION REGULATION (EU) 2017/1017

of 15 June 2017

amending Regulation (EU) No 68/2013 on the Catalogue of feed materials

(Text with EEA relevance)

CANNED PETFOOD FORMULATION

PET FOOD INDUSTRY NEED TO USE VARIOUS ADDITIVES TO GENERATE PRODUCTS WITH NUTRITIONAL BALANCE, VISUAL APPEAL, PROLONGED NUTRITIONAL QUALITY, PALATABILITY AND LONG SHELF LIFE.

ADDITIVES COMMONLY USED IN PET FOODS INCLUDE:

- COLORANTS (iron oxide, caramel color, etc.)
- FLAVORS (monosodium glutamate, etc.)
- PRESERVATIVES (tocopherols, ethoxyquin, etc.)
- EMULSYIFYING AGENTS (guar gum, xanthan gum)
- GELLING SUBSTANCES (carrageenan, agar, etc.)

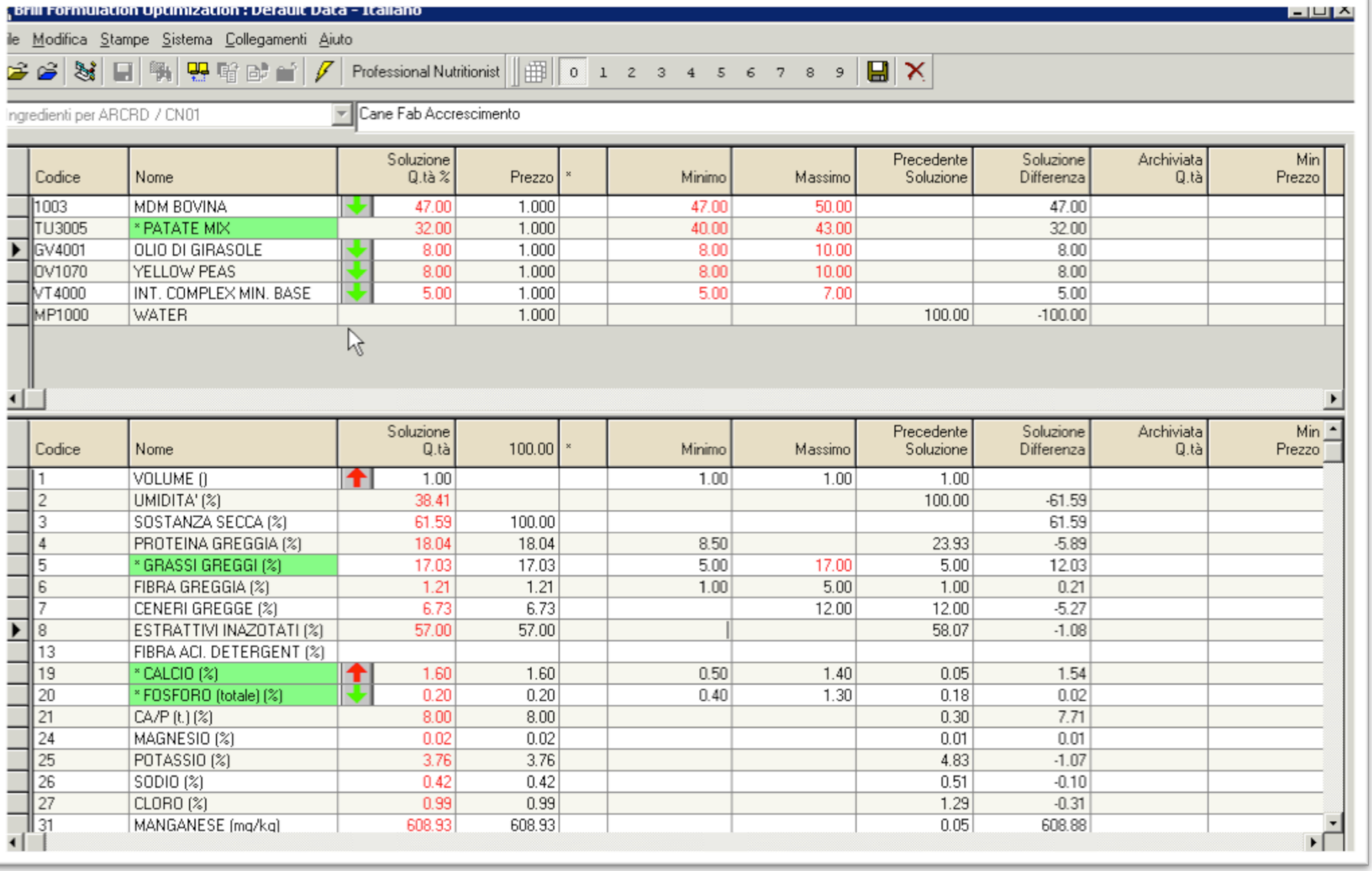
European Union

Register of Feed Additives

pursuant to Regulation (EC) No 1831/2003

Category	Functional Group	Subclassification	Code	Additive	Reference(s) of Community legal act	Reference in OJ	Date of authorisation	Expiry date of authorisation(s)
(Annex I of Reg. 1831/03)								
1	b	Antioxidants	1b306(i)	Tocopherol extracts from vegetable oils	Commission Implementing Regulation (EU) 2015/1152 of 14 July 2015	OJ L 187, 15.07.2015, p. 5	04.08.2015	04.08.2025
1	b	Antioxidants	1b306(ii)	Tocopherol- rich extracts from vegetable oils (delta rich)	Commission Implementing Regulation (EU) 2015/1152 of 14 July 2015	OJ L 187, 15.07.2015, p. 5	04.08.2015	04.08.2025
1	b	Antioxidants	1b307	Alpha-tocopherol	Commission Implementing Regulation (EU) 2015/1152 of 14 July 2015	OJ L 187, 15.07.2015, p. 5	04.08.2015	04.08.2025

(Crane SW et al. 2010)



INDUSTRIAL FORMULATION SOFTWARE

OPTIMIZATION SOFTWARE TO SAVE TIME AND MONEY, DIRECTLY CONNECTED WITH LABORATORY ANALYSIS AND SILOS

CANNED PETFOOD FORMULATION

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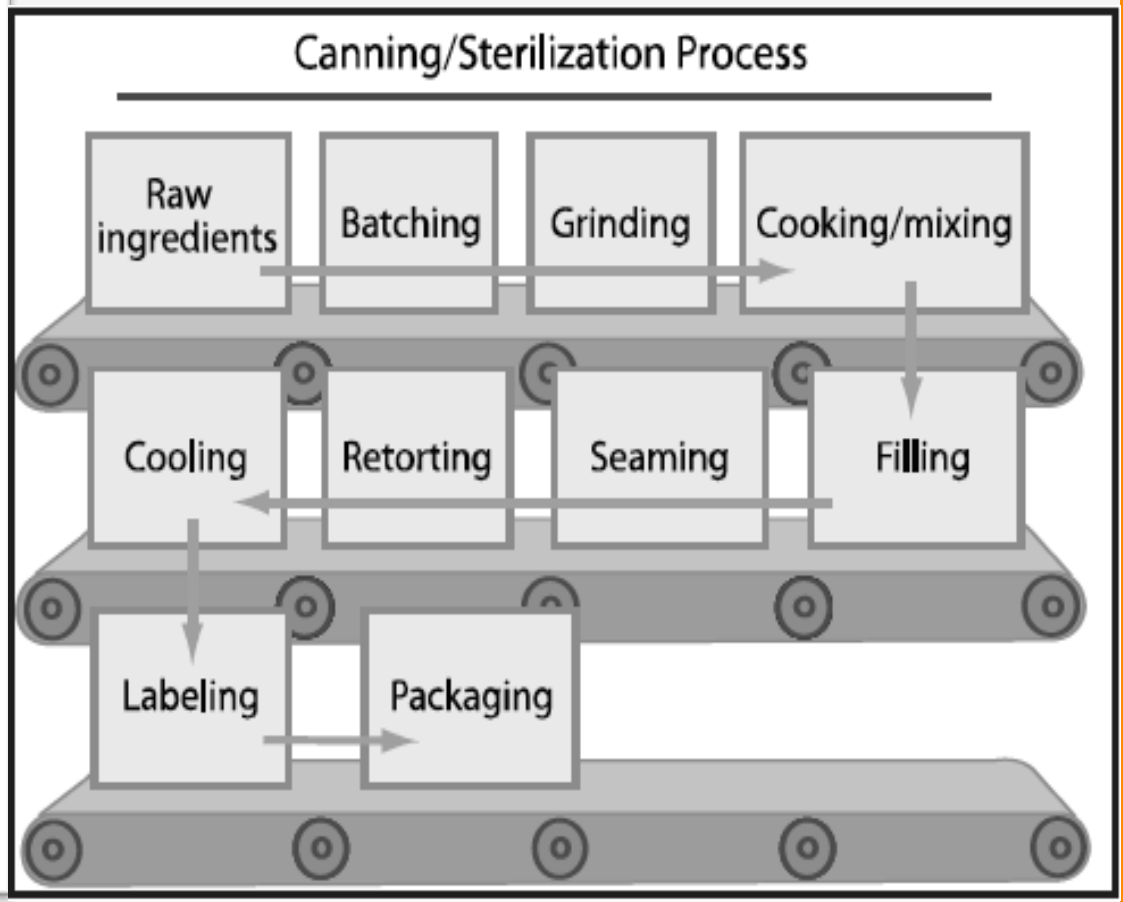
PRODUCT FORM: SEVERAL TYPES OF MOIST PET FOOD PRODUCTS AND VARIOUS SIZES AND SHAPES OF PACKAGING MATERIALS EXIST

"LOAF" products contain some carbohydrate sources (corn, rice, etc.) that finely formed loaves. These products are usually lower in moisture. Vegetable gums and other hydrocolloid thickeners are used to create a firmer texture.

"CHUNKS IN JELLY/GRAVY" products: a hygroscopic medium is used to create a two-phase food texture: "chunks" suspended in a medium. The viscosity of the suspension medium can defined by gums (agar, carrageenan) and starches for binding free water into semi-liquid gravies or soft jellies at room temperature. The chunks may be natural tissues or extruded vegetable and meat proteins. Jellies are often golden and translucent to reveal the internally embedded chunks. Gravies are frequently opaque due to the inclusion of animal tissue meals, caramel colouring or both.

Niamnuy C & Devahastin S (2010)

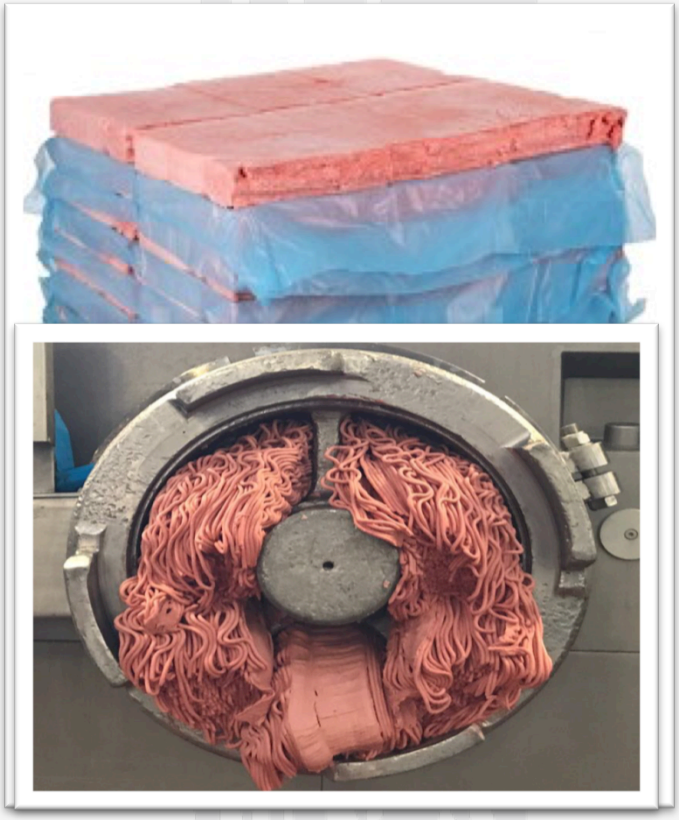
CANNED PETFOOD THERMAL PROCESSING

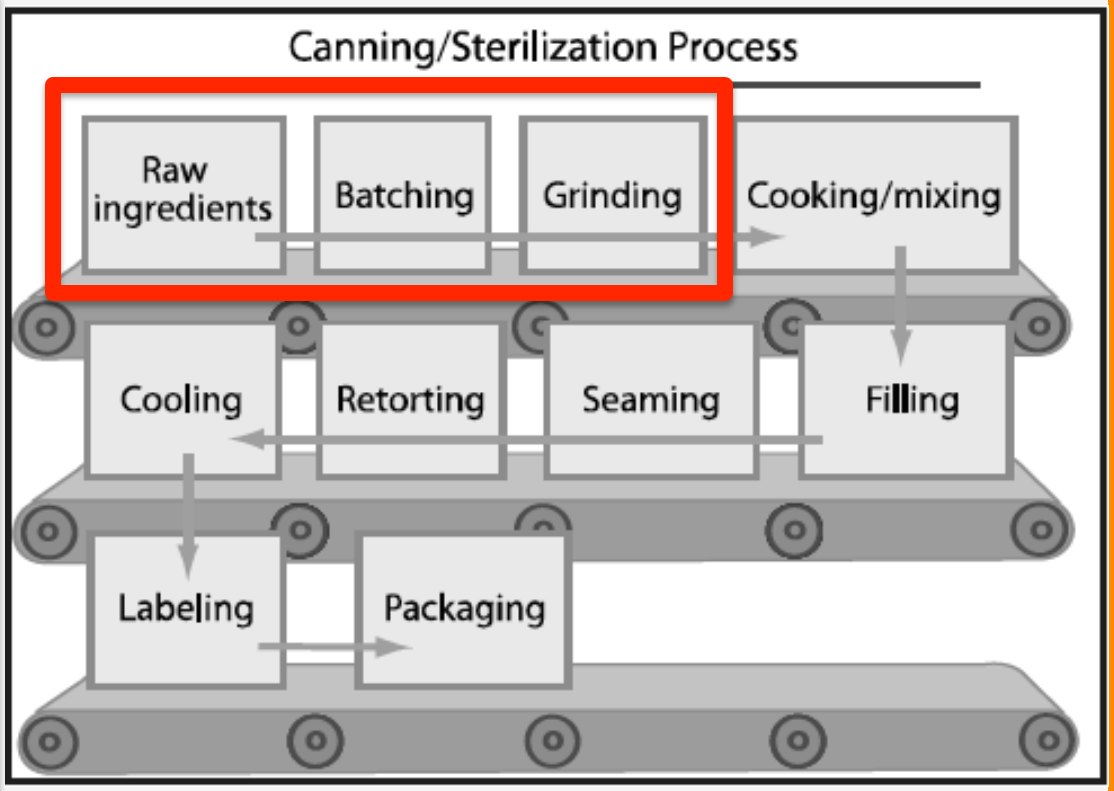


CANNING IS A A CONTINUOS FLOW, AUTOMATED AND CAREFULLY CONTROLLED

Kvamme JL & Philips TD (2003)

CANNED PETFOOD THERMAL PROCESSING



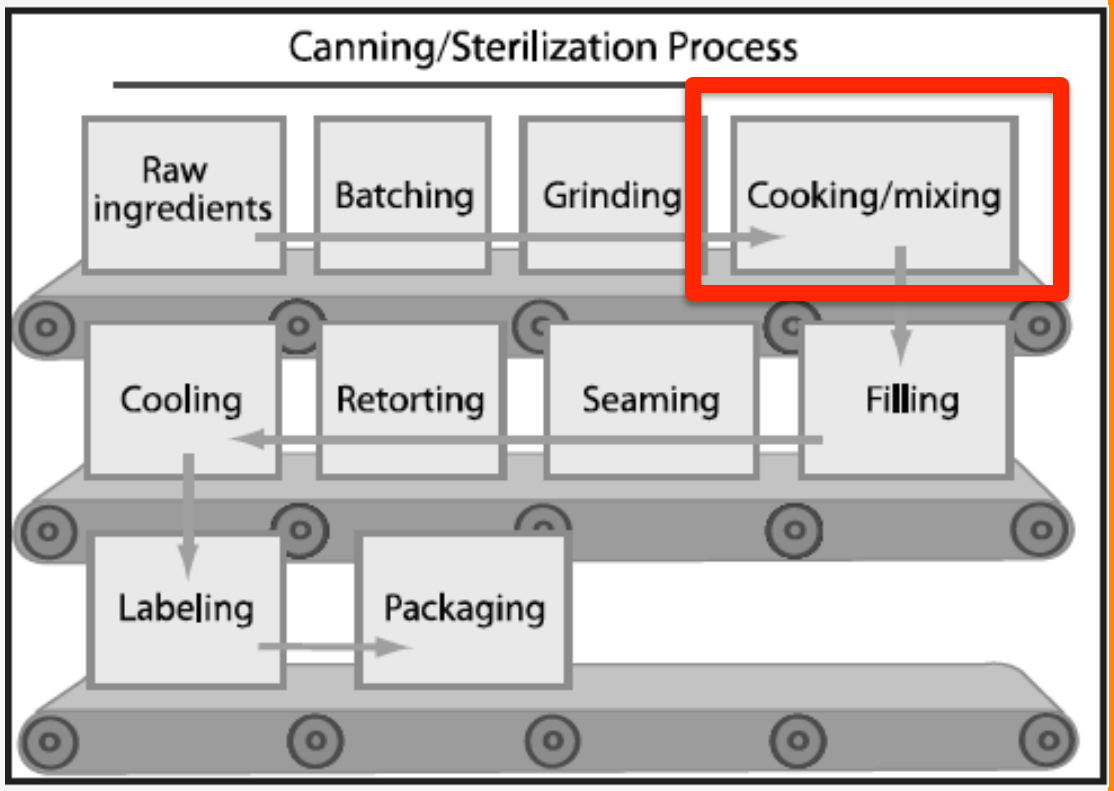


GRINDING: FRESH OR FROZEN INGREDIENTS, REQUIRE GRINDING BEFORE CANNING AND STERILIZATION. IN A BATCH PROCESS, THE INGREDIENTS ARE MEASURED BY WEIGHT, GROUND AND PLACED INTO A COOKER/MIXER IN ONE LARGE BATCH.

FROZEN MEAT IS FED INTO A MACHINE THAT CHIPS THE FROZEN BLOCKS OF MEAT INTO SMALLER PORTIONS.

Kvamme JL & Philips TD (2003)

CANNED PETFOOD THERMAL PROCESSING



COOKING/MIXING: THE MEAT IS BLENDED WITH STARCHES, GUMS, VITAMIN AND MINERAL PREMIXES AND WATER TO COMPLETE THE FORMULATION.

THE ENTIRE MIXTURE IS HEATED (**25 TO 85ºC**) TO GELATINIZE STARCHES AND BEGIN PROTEIN DENATURATION, WHICH AFFECTS THE TEXTURE, FLOWABILITY AND FLAVOR OF THE PRODUCT (**MAILLARD REACTIONS**).

THE INGREDIENTS ARE MIXED AND PROPELLED FORWARD BY A SCREW THAT CONTROLS THE SPEED AT WHICH THE MIXTURE TRAVELS AND THE DEGREE OF COOKING.

(Bailey ME, 1983)

CANNED PETFOOD THERMAL PROCESSING

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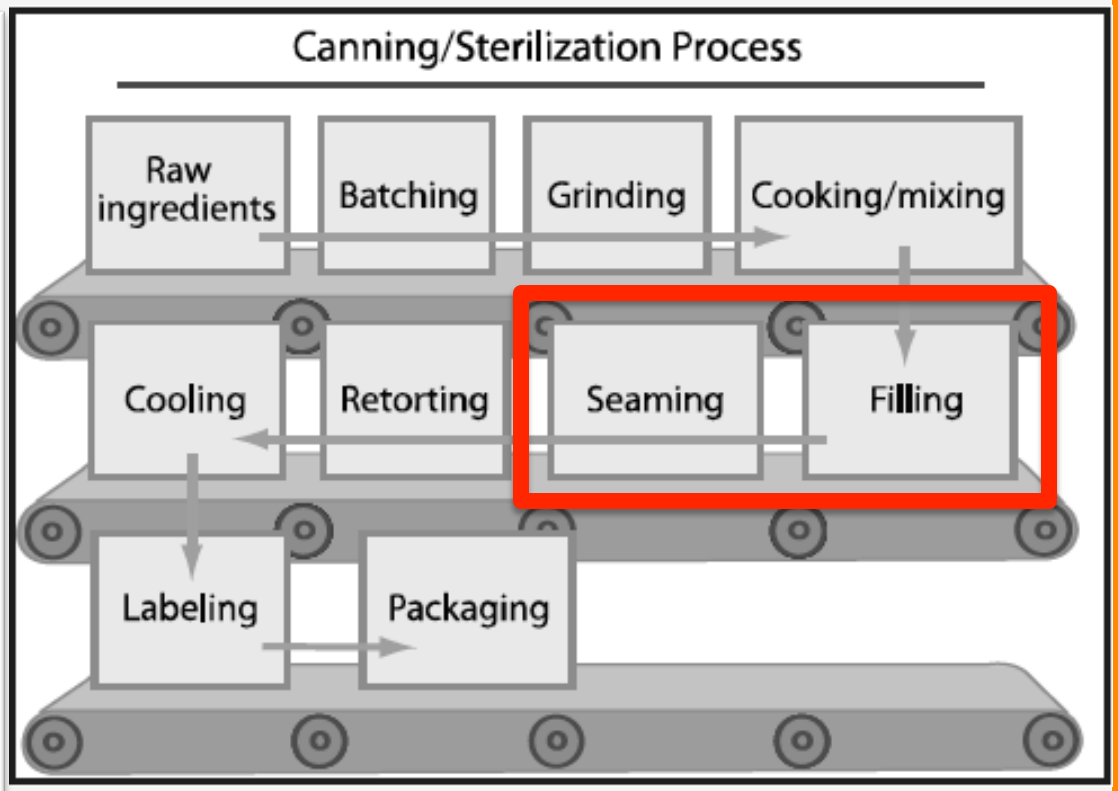
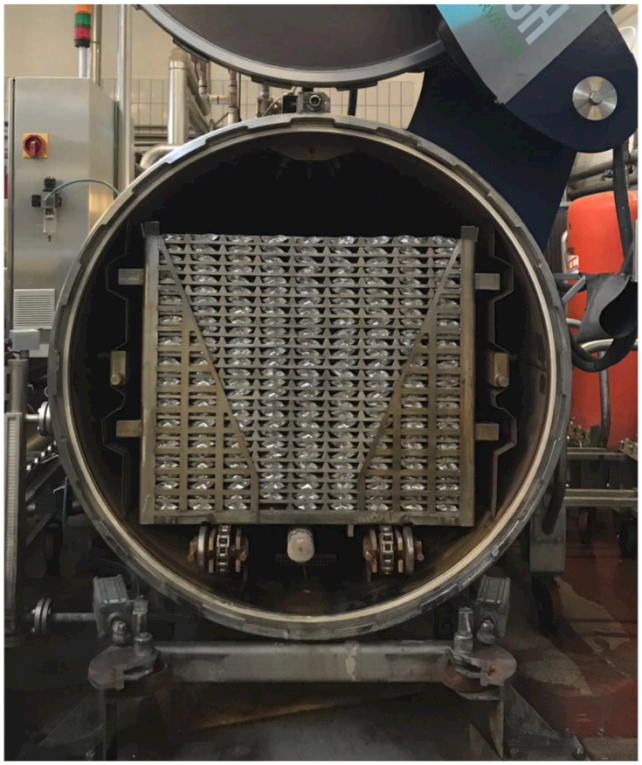


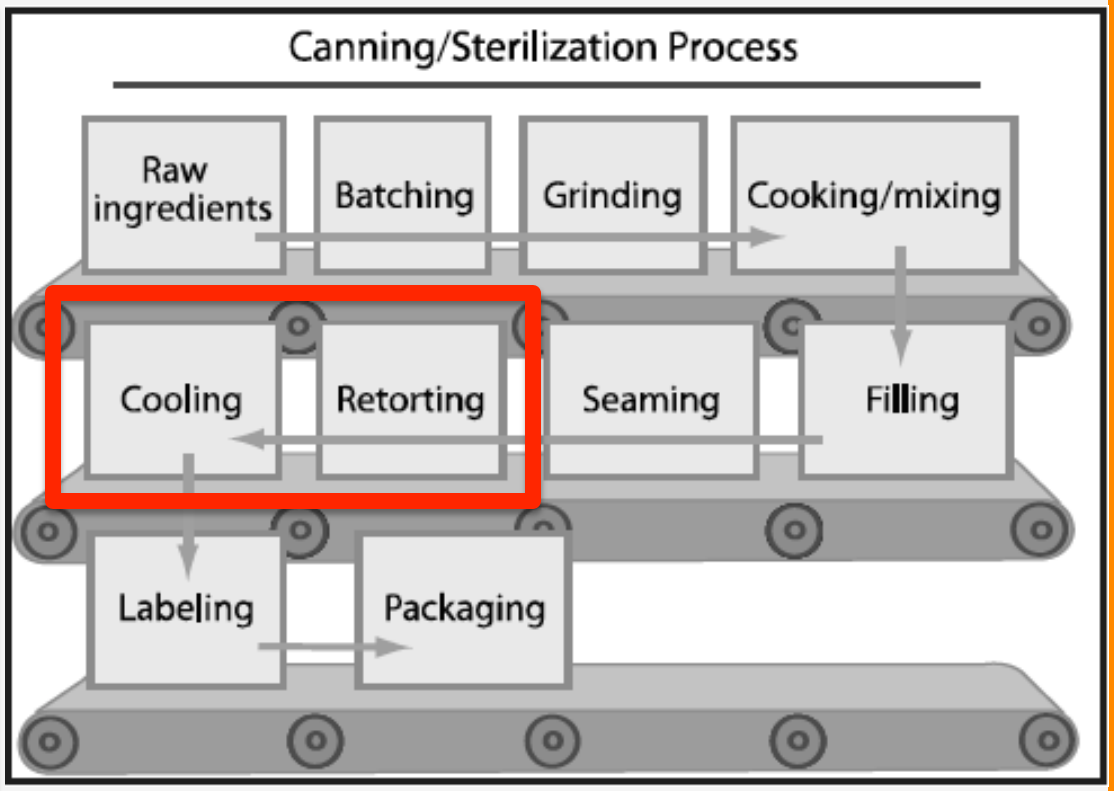
FILLER/SEALER: THE HOT MIXTURE IS USUALLY TRANSPORTED TO A HEATED STORAGE RESERVOIR ABOVE THE FILLER/SEAMER MACHINE. TO CREATE THE **VACUUM NECESSARY FOR COMMERCIAL STERILITY**, **STEAM IS INJECTED OVER THE PRODUCT JUST BEFORE SEALING**.

STEAM EFFECTIVELY DISPLACES AIR AND AFTER THE CAN IS STERILIZED AND COOLED, WATER VAPOR CONDENSES AND CONTRACTS, CREATING A **RELATIVE VACUUM**.

Kvamme JL & Philips TD (2003)

CANNED PETFOOD THERMAL PROCESSING





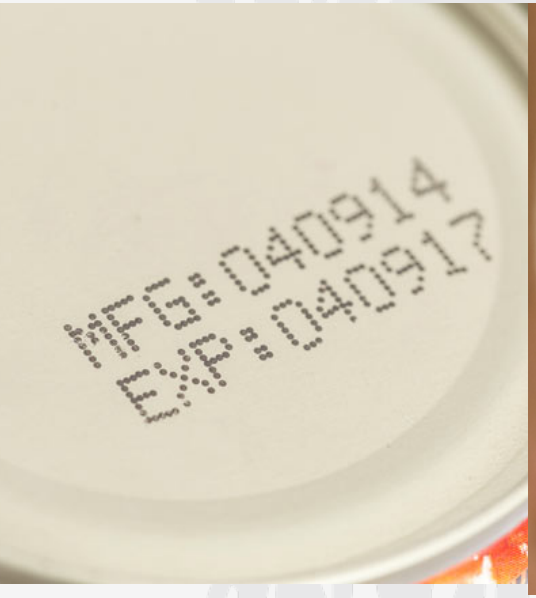
STERILIZATION/RETORTING: AFTER FILLING AND SEALING IS COMPLETED, THE CANS ARE STERILIZED IN A MACHINE CALLED A **RETORT**.

THE MAIN OBJECTIVES IN RETORTING PRODUCTS ARE TO PRESERVE THE FOOD AND ACHIEVE COMMERCIAL STERILITY. **COMMERCIAL STERILITY IS DEFINED AS THE CONDITIONS IN WHICH HEAT PROCESSING FREES A PRODUCT OF MICROORGANISMS OF PUBLIC HEALTH SIGNIFICANCE** (I.E., PATHOGENS) (LOPEZ, 1987).

THE MAIN PATHOGEN OF CONCERN IS CLOSTRIDIUM BOTULINUM

Kvamme JL & Philips TD (2003)

CANNED PET FOOD MUST BE MICROBIOLOGICALLY SAFE



SHELF LIFE OF CANNED PET FOOD PRODUCTS IS USUALLY 4 YEARS AT THE STORAGE T OF 25 °C

MICROBIAL SPOILAGE IS THE MOST FREQUENT CAUSE OF ABNORMAL CONDITIONS IN CANNED FOODS.

MICROBES GROW IN RELATION TO:

- TEMPERATURE (SPORES OF C. botulinum ARE DESTROYED AT 121.1°C FOR MINIMUM 2.45 MINUTES)

- pH (C. botulinum NOT GROW AT PH VALUE OF 4.6 OR BELOW)

- ACTIVITY WATER (A_W LESS THAN 0.85 INHIBIT THE GROWTH OF C. botulinum)

Carrion PA & Thompson LJ (2014)

F_0-VALUE (LETHALITY VALUE)

F_0–VALUE: TIME NEEDED (**IN MINUTES**) AT A CERTAIN TEMPERATURE (121.1ºC) TO OBTAIN REQUIRED REDUCTION OF MICRO - ORGANISMS.

Product	F_0 values (minimum)
Asparagus	2.0 - 6.0
Tomato juice	0.7
Peas	6.0 – 12.0
Chicken, boned	6.0 – 8.0
Corned beef	5.0
Fish in brine	5.0 – 8.0
Ham (sterile)	3.0 – 4.0
Petfood	**6.0 – 12.0**
Sweetened condensed milk	2.0

IN PETFOOD INDUSTRY, THE MOST HEAT RESISTANT PATHOGEN IS CLOSTRIDIUM BOTULINUM SPORE FOR WHICH **A MINIMUM F_0-VALUE OF 2.58** MIN IS NEEDED.

INCLUDING A SUFFICIENT SAFETY MARGIN, CANNED PETFOOD IN OUR COUNTRY SHOULD BE PRODUCED WITH **MINIMUM F-VALUE OF 6.**

F_0-VALUE MEASURING EQUIPMENT

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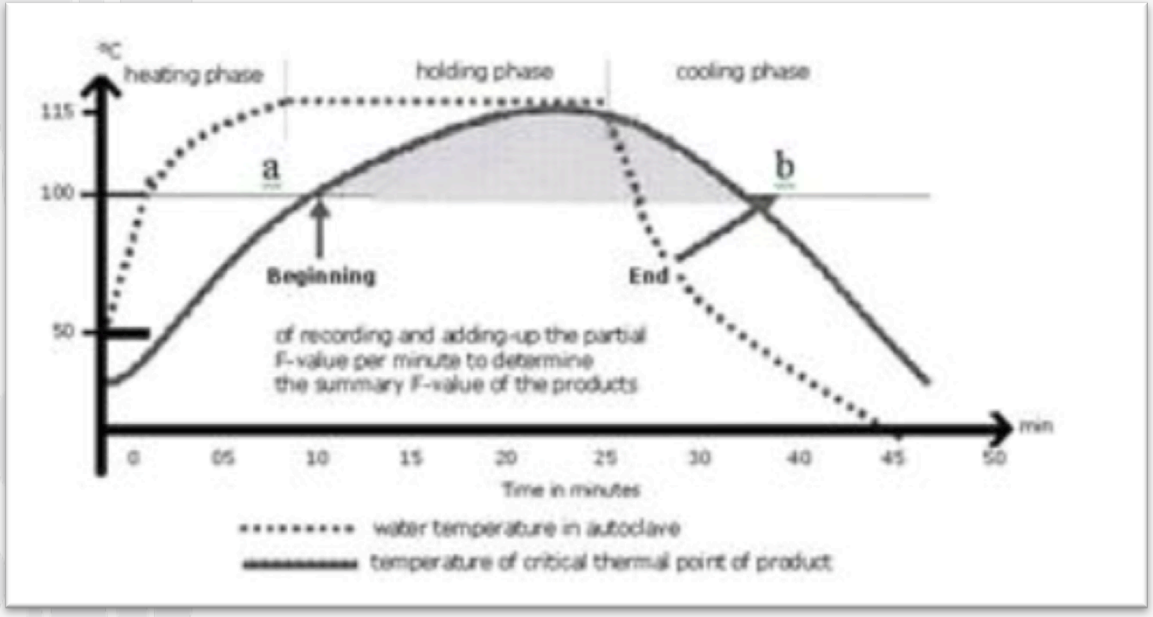
F0-VALUE IS A CALCULATION BY SUM OF PARTIAL F-VALUES DURING DIFFERENT PHASES OF STERILIZATION (HEATING, HOLDING AND COOLING)



DATA TRACE (AFTER PROCESS MEASUREMENT)

Area to measure

REAL TIME (DURING PROCESS MEASUREMENT)

THERMAL PROCESSING

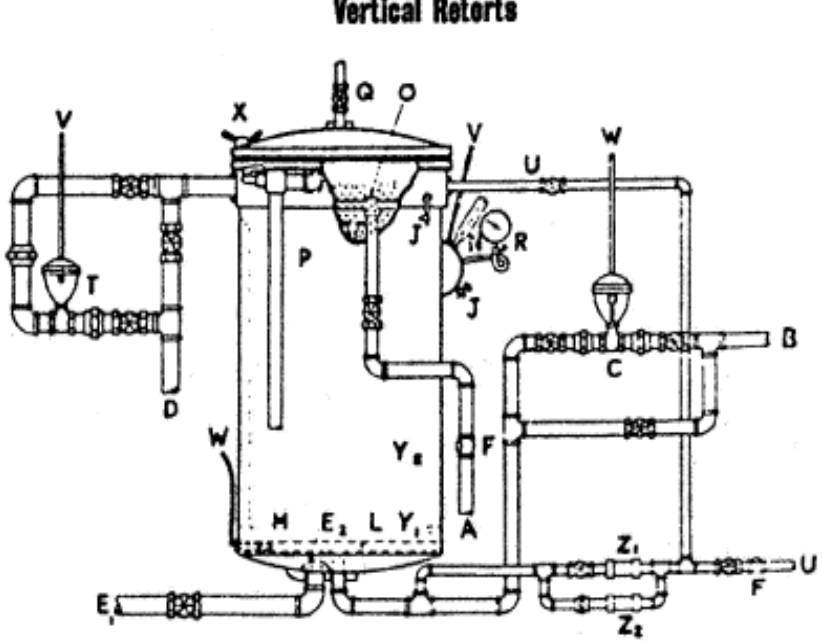
IN PETFOOD, MANY DIFFERENT TYPES OF RETORT COULD BE USED FOR THE THERMAL PROCESSING:

- HYDROSTATIC RETORT

- STILL RETORT

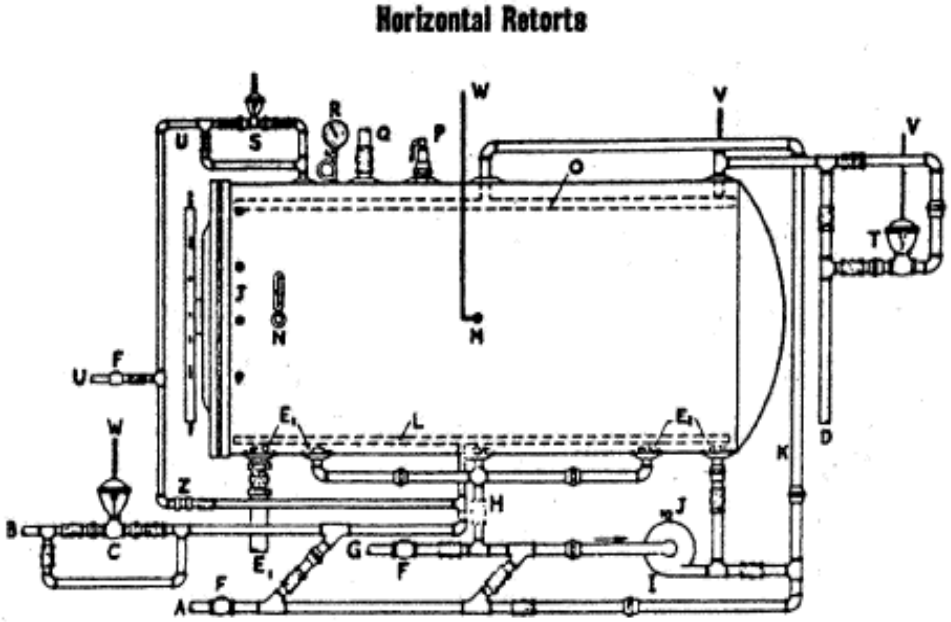
B

STILL RETORT



A STILL RETORT IS A CATCH-TYPE, NON-AGITATING PRESSURE VESSEL.

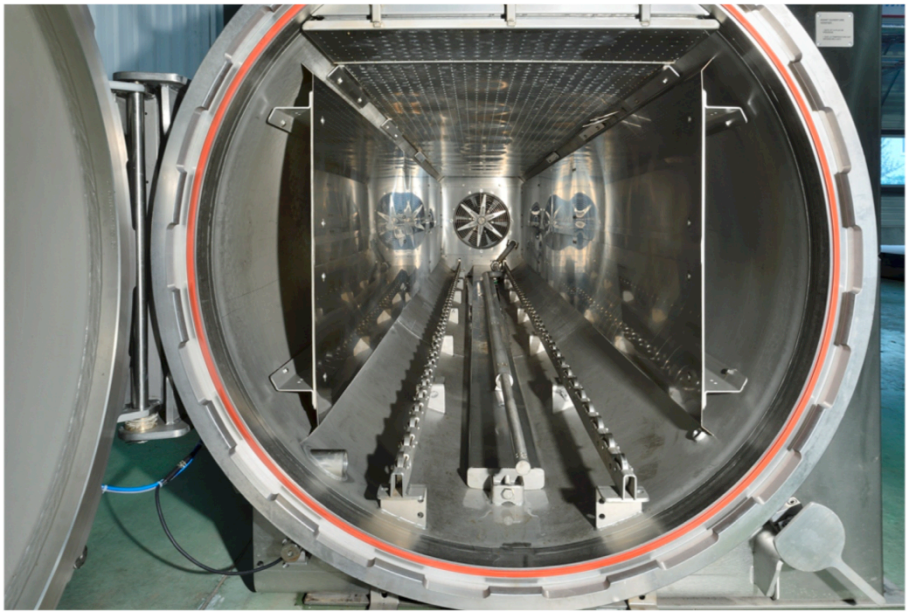
- VERTICAL RETORT

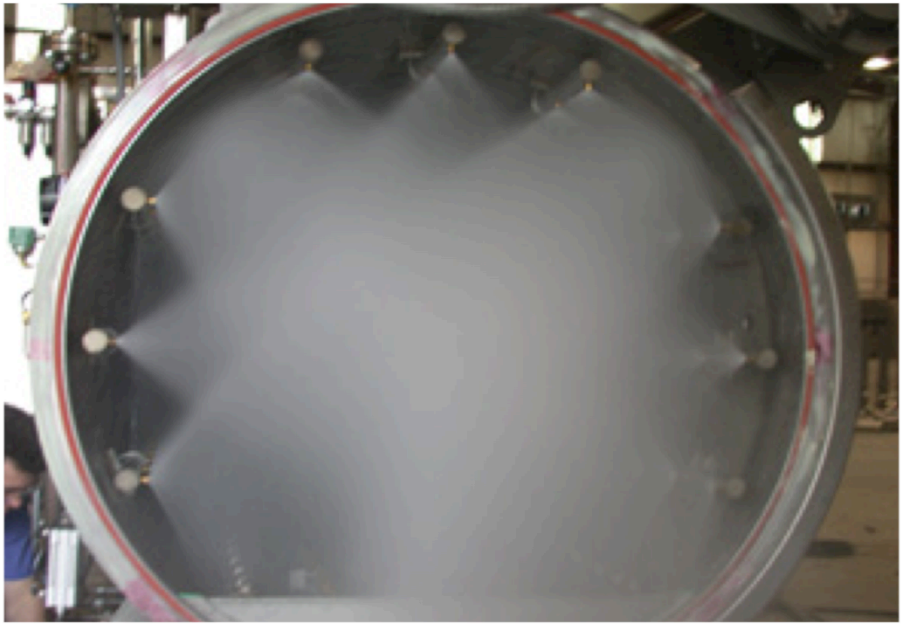


- HORIZONTAL RETORT

Kvamme JL & Philips TD (2003)

STILL RETORT





PET FOOD CANS ARE STACKED INTO **BASKETS** FOR LOADING AND UNLOADING THE RETORT.

THE HEATING MEDIUM USED IN THE RETORTS IS **STEAM**.
THE STEAM SUPPLY SHOULD BE ADEGUATE TO PROCESSING TEMPERATURE IN A RESONABLE TIMES.

STILL RETORT COMPONENTS

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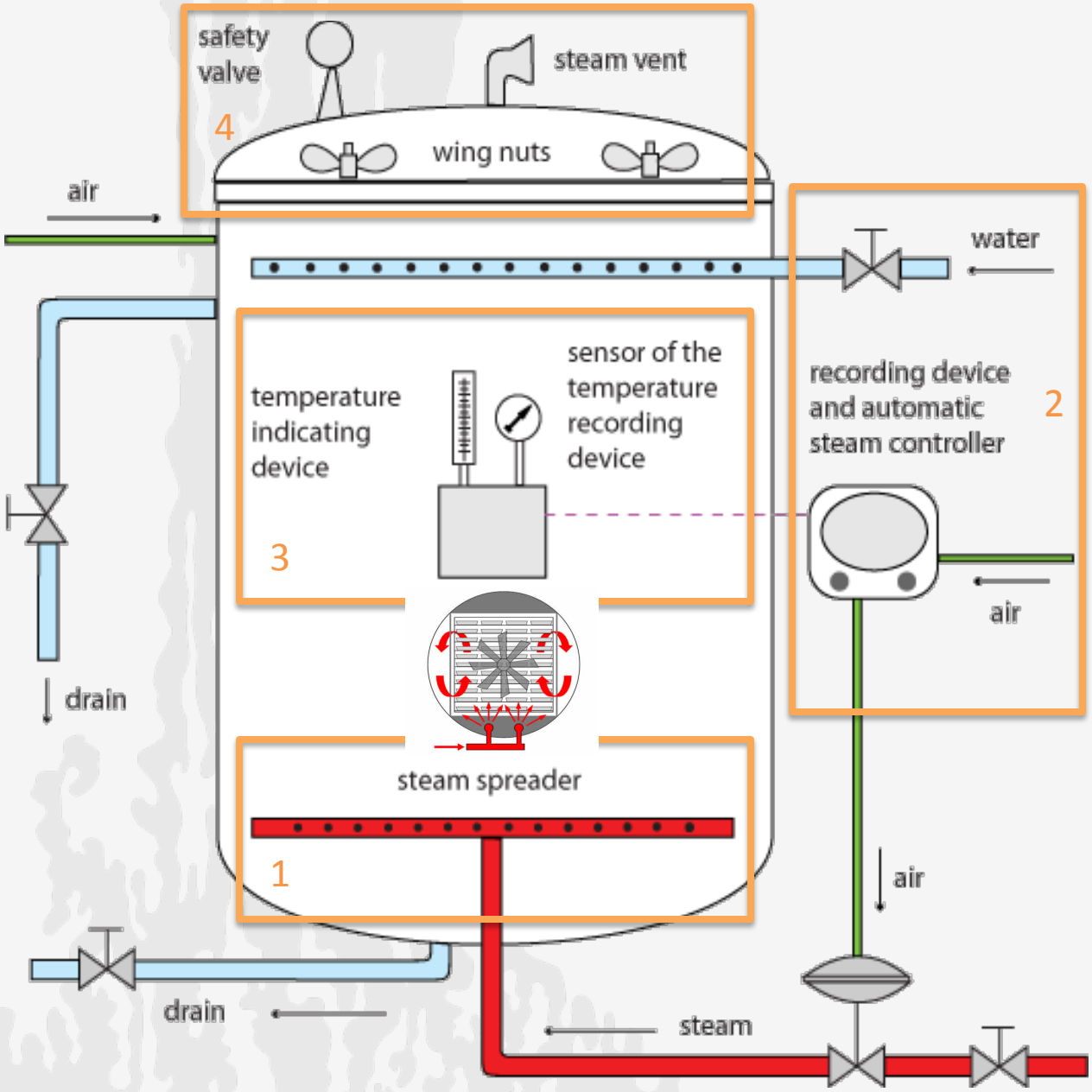


1. **SPREADERS AND BLEEDERS PROMOTE STEAM** distribution and CIRCULATION WITHIN RETORT (mandatory in the horizontal retort and when divider plates are used)

2. **WATER AND AIR SUPPLY TO COOL** THE CONTAINERS AFTER PROCESSING

3. EACH RETORT IS REQUIRED TO HAVE A **TEMPERATURE INDICATING AND RECORDING DEVICES** (Sensors are installeted directly through the wall of the retort)

4. **VENTS AND LARGE VALVE** TO ELIMINATE AIR FROM THE RETORT BEFORE RETORT CYCLE (air must be remove because acts as insulator and does not transfer heat to the containers as efficiently as does steam)

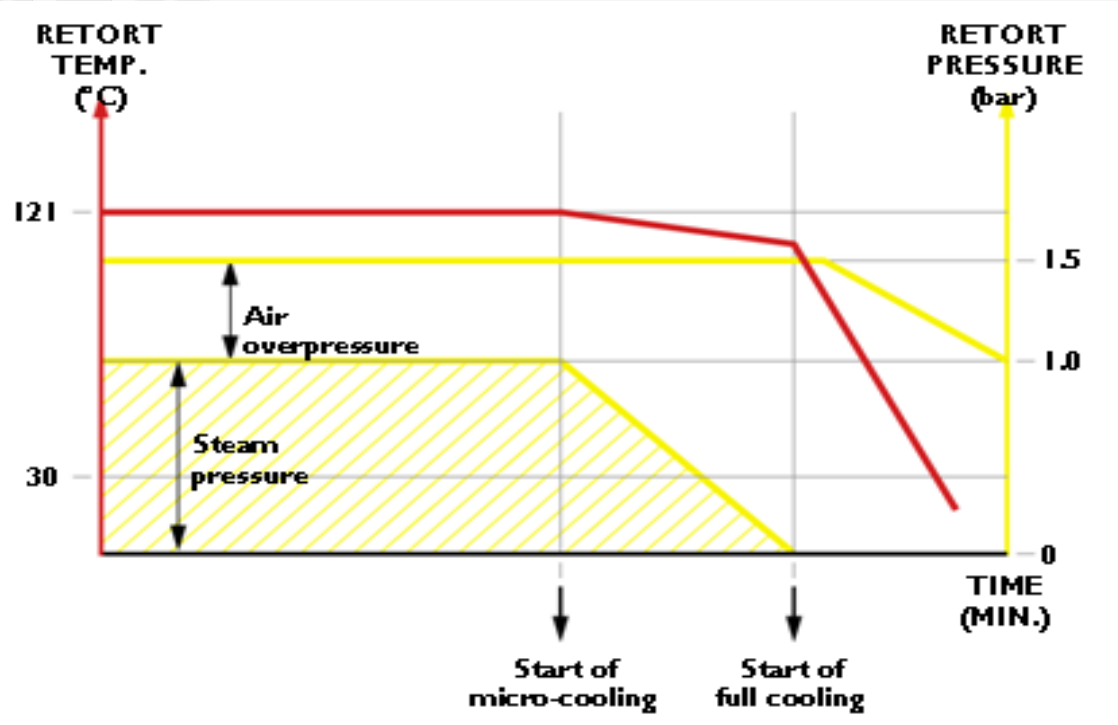
STILL RETORT PROCESSING

B

IN STEAM RETORT, GENERALLY, THE PRESSURE AT 121.1 °C IS 103.4 kilopascals (1.6 bar). ANY PRESSURE SUPPLIED IN EXCESS TO THAT IS REFERRED TO AS **OVERPRESSURE**.

ADDITIONAL STEAM IS INTRODUCED DURING THE PROCESSING CYCLE TO PROVIDE THIS OVERPRESSURE AND IT IS REQUIRED **TO STERILIZE AND TO MAINTAIN THE INTEGRITY OF CONTAINERS (EACH DIFFERENT CONTAINER TYPE MAY REQUIRED DIFFERENT OVERPRESSURE LEVEL AND COOLING DUE TO THE FLEXIBILITY OF THE CONTAINERS)**

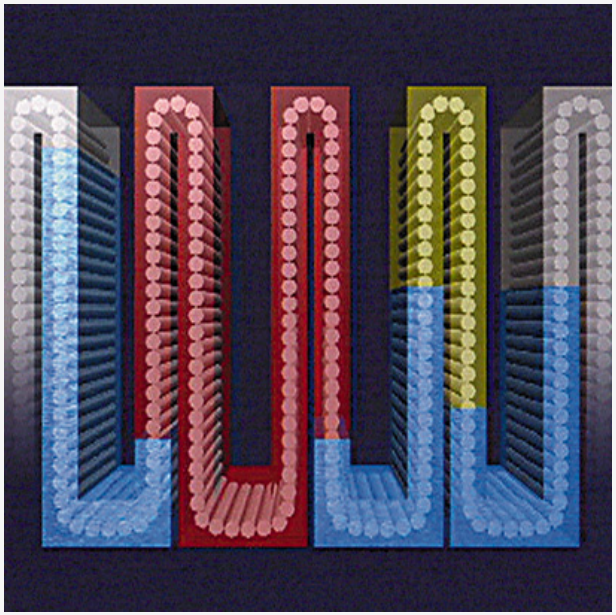
THE **PRESSURE COOLING** IS REQUIRED TO REDUCE THE INTERNAL PRESSURE OF THE CANS TO A SAFE LEVEL. THEN THE CANS MAY BE EXPOSED TO ATMOSPHERIC PRESSURE WITHOUT DAMAGES.



HYDROSTATIC RETORT

HYDROSTATIC RETORT OPERATES AT A **CONSTANT PROCESS TEMPERATURE** AND HAS A **CONTINUAL FLOW OF CANS THROUGHT THE PROCESS VESSEL.**

WITH CANS ROTATION DURING PROCESSING



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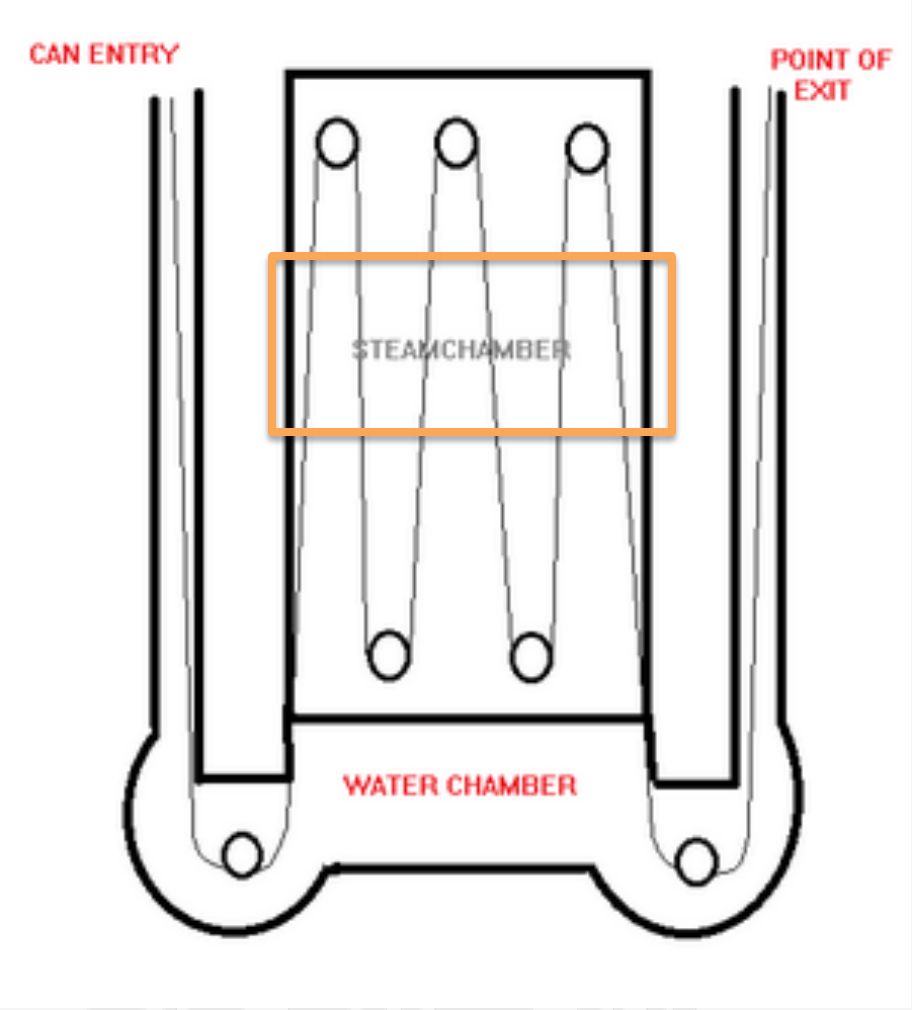
HYDROSTATIC RETORT



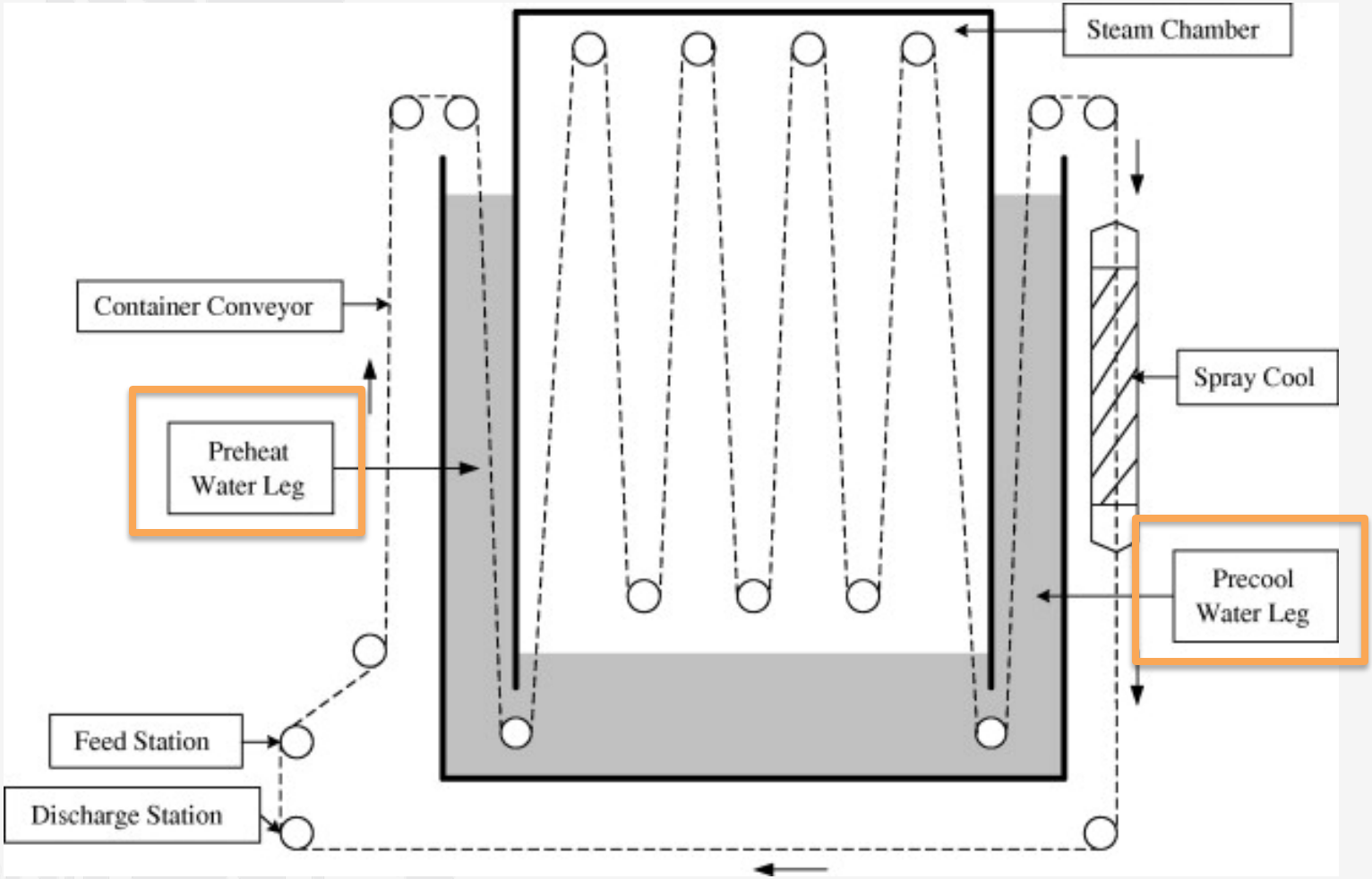
IN HYDROSTATIC RETORT**,** THERMAL PROCESS
OCCURS IN THE A PROCESSING CHAMBER CALLED "**STEAM DOME**" WITH A CONSTANT ELEVATED TERMPERATURE AND PRESSURE.

THE CONSTANT PRESSURE IS MANTAINED BY THE WEIGHT OF **WATER COLUMNS** (feed and discharge legs)

Example: a water column above the steam-water interface with a height of 11.3 metres provides 103.3 kilopascal of pressure in the steam dome

Kvamme JL & Philips TD (2003)

HYDROSTATIC RETORT COMPONENTS



- PROCESSING CHAMBER (STEAM DOME)
- FEED LEG (SINGLE WATER COLUMN)
- DISCHARGE LEG (SINGLE OR MULTIPLE WATER COLUMNS)
- CONTAINER CARRIER CHAINS
- TEMPERATURE DEVICES (STEAM AND WATER)
- WATER PUMPS (FROM DISCHARGE LEG TO FEED LEG AT THE BASE; FROM FEED LEG TO DISCHARGE LEG AT THE TOP)

REFERENCES

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CANNED PET FOOD DEVELOPMENT

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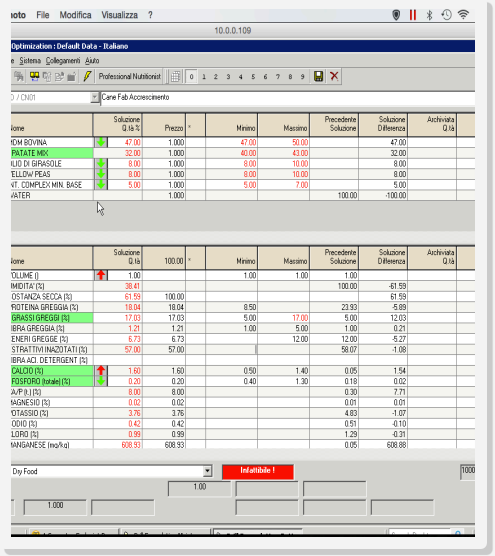

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Thanks for your attention