



TECHNICAL APPLICATION
INFORMATION



**Continuous Production
of Pectin Based
Foamed Candy Products
Using the Pressure Foaming Process**

FOAMED *Candy Products*

Actually, foamed candy products are setting a new trend. Just their airy, soft and tender texture makes this special type of confectionery, which is also known as aerated confectionery, popular to the young and the young at heart.

By the injection of air or other gases and in presence of a foaming agent, foam structures with densities below 1000g/l are obtained in the production of foamed candy products. Depending on recipe and technology, foamed candy masses of different consistency can be reached.

A distinction is drawn between more soft and more firm foamed candy products, which can be individually formed as regards colour and shape.

Specific weights of different foamed candy products:

The diverse types of foamed candy products are mostly produced with the raw materials

Products	Dichte [g/l]
Chocolate covered marshmallows	170 - 250
Foam mass for waffle	250 - 300
Marshmallows (cut, deposited)	300 - 500
Foam cakes, zefir, bird milk	400 - 600
Foamed jelly fruits, foam bananas	800
Chewy candy	900



stated as follows:

- protein as foaming agent
- sucrose
- glucose fructose syrup
- sorbitol
- water
- colouring and flavouring agents

Depending on the type of product, additionally gelling agents such as agar agar or pectin are used to improve single product properties.

Depending on the type of foaming agent, the

PRODUCTION of Foamed Candy Products

continuous production of foamed candy products is effected according to the 2-step- resp. 1-step-process by using a pressure foaming mixer.

A pressure foaming mixer consists of at least 3 components:

1. a haulage plant for the pumpable product (pumping),
2. a device with which the gas is injected into the product,
3. a closed mix head to produce the foam (product + gas = foam).

The closed mix head consists of rotor and stator. Both are furnished with gear rings which comb into each other and with that move contact-free over one another if the rotor in the stator is turned. Now when the medium, to which gas is added when entering the mix head, flows through this mix head, this mixture is exposed to different forces.

This mechanical energy input into the medium effects a homogeneous distribution of the gas in the product.

The rotational speed of the mix head drive is controllable and thus adjustable to the requirements of the product.

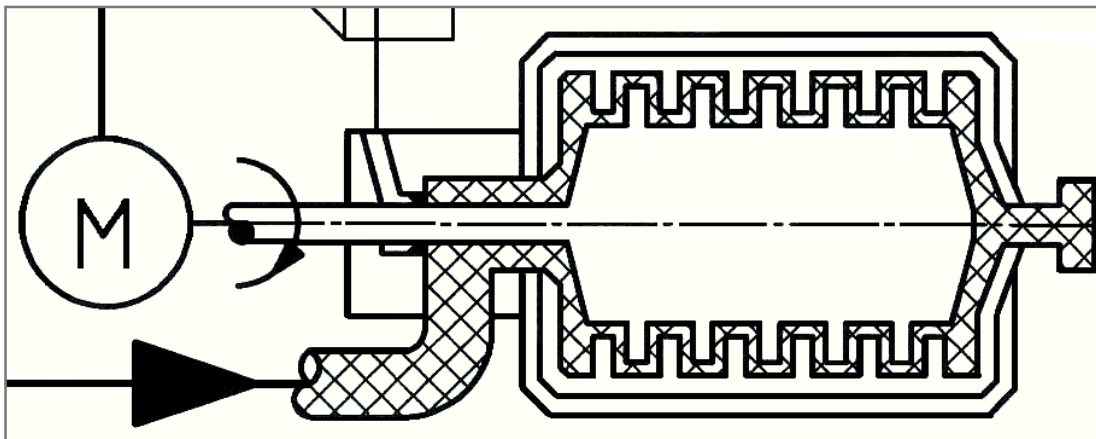


Fig. 1: Profile of the mix head in a pressure foaming mixer

PRODUCTION *according to the 2-Step-Process*

When producing foamed candy products according to the 2-step-process, two solutions are prepared:

1. Protein solution (temperature 40-50°C)
2. Sugar syrup solution (temperature 110-115°C)

Both solutions are filled separately into the mixhead of the pressure foaming mixer and then foamed together. The protein solution may contain further components such as fruit pulp, pectin and buffer salts.

In this 2-step-process mainly egg-white is used as foaming agent. However, also milk protein products and vegetable proteins can be used.

The use of egg-white results in large-volume foams as the ovalbumin (egg-white contains 58% ovalbumin) coagulates under heat impact, forms some kind of gel and thus results in a stable, elastic texture. The eggwhite acts as foaming agent and at the same time as foam stabilizer.

Pectin can additionally be used as gelling agent to forward the gelation process and with that to reach a quicker formability as well as to improve texture and temperature stability of the products.

The Russian foam cake "zefir" is a typical product for the continuous production with the 2-step-process. This traditional Soviet foamed candy product has been produced already since the mid-thirties in the later states of the Soviet Union and means translated (Greek „zefirus“) „tender, light Western wind“, son of the goddess Eos.

For this product traditionally egg-white as foaming agent and pectin as gelling agent are used. For more sour zefir products H&F Classic Pectins for confectionery products such as Pectin Classic AS 501 with the addition of buffer substances / acid are used.

Pectin Amid CS 005 is used if less sour and thus, as regards taste, more sweet products are desired.

PRODUCTION ACCORDING *to the 1-Step-Process*

When producing foamed candy products according to the 2-step-process, all ingredients are mixed together, heated to 80 – 95°C and foamed together in the mix head of the pressure foaming mixer. The production with egg-white according to the 1-step-process is not possible due to its property to coagulate under heat impact. Therefore mostly gelatine is used in this method as foaming agent on the one side and also as gelling agent on the other side.

Foamed products with gelatine require long setting times, mostly 24 hours to reach a comparable firmness. At the same time these products show a very low melting point which in warmer seasons or also in Southern countries influences badly the shelf life of gelatine based products.

Protein products which do not coagulate under heat impact such as concentrates from whey proteins, or hydrolyzed vegetable proteins such as hydrolyzed wheat glutens, but also hydrolysates from pig gelatine can be used as foaming agents.

These proteins show excellent foaming properties and a high foaming capacity and can be foamed at higher temperatures.

However, the foams do not remain stable. In order to stabilize the foams, gelling agents have to be used which enable a quick gelation.

This is guaranteed by the H&F Pectin Amid CS 005. This special confectionery pectin can be used without adding buffer substances and has been developed for the production of sweet products with low acidic flavour as regards taste.

The combination of protein products as foaming agents, which do not coagulate under heat impact and which do not create an own foam stability, and the H&F Pectin Amid CS 005 allow the continuous production of foamed candy products according to the 1-step-process.

Pectin Amid CS 005 as quick gelling agent is intended to stabilize the instable foam as fast as possible. Due to the quick gelation of the pectin, the products can be taken out of the shaping forms already after a very short time (30 to 60 minutes). The products show the desired airy as well as soft and short texture which is typical for pectin.

Type of protein	Process	Pectin	Application
Egg-white	2-step-process	Pectin Amid CS 005 Pectin Classic AS 501 Pectin Classic AS 401 + buffer	Foam cake zefir
Whey protein concentrate	1-step-process	Pectin Amid CS 005	Foamed candy „without gelatine“
Wheat gluten hydrolysate	1-step-process	Pectin Amid CS 005	Foamed candy „vegetable“
Gelatine hydrolysate	1-step-process	Pectin Amid CS 005	Foamed candy

SUMMARY

Applying suitable proteins as foaming agents, pectin based foamed candy products can be produced continuously according to the 2-step and 1-step-process by using a pressure foaming mixer.

Due to the use of pectin, the foam products produced according to the 2-step-process, mostly with egg-white, show conspicuously shorter gelling times than with other hydrocolloids.

Already after short time the pectin products show a firmness lying above the protein denaturation thus a quick processing of the products is guaranteed. Additionally the stability of the products towards temperature is increased by the use of pectin.

With the H&F Pectin Amid CS 005 it is possible to produce foamed candy products according to the 1-step-process with protein products, which do not independently form foams by denaturation,

Due to the quick gelation of the pectin the products can be taken out of the mould forms already after shortest time. The products show the desired airy as well as soft and short texture which is typical for pectin.

Additionally these products have a clearly higher melting point than gelatine based products. With suitable protein products as foaming agent and combined with Pectin Amid CS 005, e.g. gelatine-free foamed candy products or especially purely vegetable (vegetarian) foamed candy products can be produced.

Foam Cake (Zefir), 2-step-process
Product Pectin Classic AS 501
Pectin-protein-pulp (60% TSS, 50°C):

- 1.2% Pectin Classic AS 501
- 0.3% tri sodium citrate
- 7.0% Egg-white solution 12% TSS
- 32.0% Sucrose
- 20.0% Apple pulp, abt. 10% TSS

60.5% Input

Sugar syrup solution (85% SS, 110°C):

- 35.0% Sucrose
- 14.0% Maltose containing glucose syrup
- 5.0% Water
- Colour, flavour
- 1.0% Citric acid solution 50%

55.0% Input

TSS: 72 – 74% pH: 3.5 – 3.8

Setting pressure foaming mixer:
Zefir 2-step-process

Foam density: 600g/l

- Pump1 : 30l/h (Pectin-protein-pulp)
- Pump2 : 27l/h (sugar-syrup-solution)

Mix head setting: 350 U/min

Mixer setting: automatic

The container of the sugar solution and the supply to the mix head are heated to abt. 90°C.

Product temperature: 55 – 60°C

- A Mix pectin, sodium citrate and a part of the sucrose (from total amount).
- B Stir mixture „A“ into the apple pulp and let swell overnight.
- C Mix the protein solution with the remaining sucrose.
- D Mix mixtures „B“ and „C“, heat to abt. 50°C and fill into container 1.
- E Prepare sugar-syrup-solution and heat to 110°C (85% TSS).
- F Add colour and flavour.
- G Add citric acid solution.
- H Fill the mass into the heated container 2 of a pressure foaming mixer.
- I Dress the mass at abt. 55°C and let dry up to reaching 82% TSS.

Output 100%.

Foamed Candy, 1-step-process
Product Pectin Amid CS 005

1.20 – 1.50% Pectin Amid CS 005
 0.50 – 1.00% Protein powder
 37.50% Sucrose
 36.00% Maltose containing glucose
 syrup
 4.50% Sorbitol
 4.00% Fructose
 16.00% Water
 Colour, flavour
 0.30 – 0.40% Citric acid solution 50%

 100% Output
 TSS: 78% pH: 3.6 – 3.7

- A** Mix the protein powder with the fourfold amount of water (from total amount).
B Mix the pectin with the fivefold amount of sucrose (from total amount).
C Stir mixture „B“ into the remaining water and heat to 90°C.
D Add the remaining sucrose, fructose, sorbitol and glucose syrup and heat to 95°C.
E Add colour and flavour.
F Add protein solution „A“ under stirring.
G Add citric acid solution.
H Fill the mass into the heated container of a foam pressure mixer.
I Give the foamed mass into moulding starch, mass temperature abt. 75°C.
 Taking out after 30 – 60 minutes.

Setting pressure foaming mixer:
Foamed Candy 1-step-process

Foam density: 800g/l (for deposited products)
 300g/l (for dressed products)

Product flow: 35l/h
 Setting mix head: 350 U/min
 Setting mixer: automatic

The container and the supply to the mix head are heated to abt. 90°C.

Product temperature: 70 – 72°C