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RESEARCH ON THE EFFECTIVENESS SCALDING DEVICE FRUITS AND VEGETABLES, USING GEOTHERMAL WATER AS A HEATING AGENT

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Abstract

This paper aims to study the efficiency of scalding device fruit and vegetables, when using geothermal water as a secondary agent heating water solution of salts or organic acids, syrup or the environment saturated steam products undergo to achieve operation the of scalding device.

Heat treatment of products depicting action with deep implications in terms of technical, sensory and nutritional. Blanching of food products in hot water is carried out in solutions of organic salts and acids, in syrup or into the environment of saturated steam by means of machines called scalding device.

In phases of this technical process of blanching, heat transfer occurs either to help achieve certain applications that require certain conditions or to bring some fluid conditions appropriate technological phase desired.

By using geothermal water as secondary heating agent bring significant savings in terms of energy in the process of blanching Whereas, by its use, lower costs for heating water or steam production and increase productivity of scalding device

Key words: geothermal whater, blanching, heat transfer, heat exchange surface, technological phase

INTRODUCTION

Blanching is used for fruit and vegetables whole or in pieces, ensuring the following consequences:

- deactivation of enzymes;
- reduction of microorganisms;
- Air removal from tissues;
- increase the elasticity of fruits and vegetables to more rational use of container volume;
- improving the process of osmosis;
- Establishment of product quality;
- elimination of bad taste. (Răşenescu I 1972, Răşenescu I at all,1987, Pica, E, 1999 Gh., Banu, C., et all, 1998, Banu, C., et all 1999 Banu, C., et all, 1993, Amarfi, R et all 1948, Balc, G 2000)

In the process of blanching particular importance is the quality of water. Insignificant losses in hard water, instead it is recommended only for

those foods that have the inclination to decompozition at high temperatures; hard water is not suitable for the vast majority of plant products.

The existence of iron in the water, due to reaction with phenolics, particularly with caffeic acid derivatives, especially celery, cauliflower, apples, pears, quince. Iron salts and copper catalyzed vitamin C obsolescence, and the phenomena of oxidation of fats, even the vegetables with a low fat content, reducing their taste. Because of scarcity, in the case of scalding water, are much more extensive, there is a tendency to expand the blanching in the steam. (Răşenescu I 1972, Răşenescu I at all,1987, Pica, E, 1999 Gh., Banu, C., et all, 1998, Banu, C., et all 1999 Banu, C., et all, 1993, Amarfi, R et all 1948, Balc, G 2000)

It is necessary that the arrangements for blanching to be fixed for each product, regardless of the process applied, depending on food preservation process used. Preservation by sterilization is recommended to avoid excessive blanching, since it is not necessary to carry out a complete inactivation of enzymes, and a thermal process too hard would have a negative influence. A duration too high blanch nutrient losses intensified, causing degradation of cellular tissue, the emergence of a pasty consistency and coating fluid disorder. The blanch operation is dependent on two factors: temperature and time. (Ionescu D at all, 2004, Pantea Emilia Valentina, 2010, G. Ganea et all 2007, Gherman, V, 1997 Emilia Pantea at all, 2013, Moţoc, V at all, 1968, Muscă, M, 1984)

Beach changing the temperature is 85-98° C, within 1-5 minutes. In most cases, the blanching is achieved by treatment of the products in water heated to a high temperature, similar to the temperature of blanch.

In order to expedite these goals through a series of research, was tried for water heating to achieve with blanchers using geothermal water, this is a considerable resource in Bihor area reaching temperatures between 40 and 115 degrees C. (David, D., at all, 1984, Pantea Emilia Valentina, 2010, G. Ganea et all 2007, Georgescu N at all, 1964, Emilia Pantea at all, 2013, Moţoc, V at all, 1968, Muscă, M, 1984)

The blanching products can be done using several types of machines, of which the most common are: dual scalding device and different types of of scalding devices with continuous action.

MATERIAL AND METHOD

Inside of scalding device, installation are mounted three systems of connection: piping system for water supply pipe system for the supply of steam pipe system for geothermal water supply which is to pre-heat incoming wash water destined for blanch of fruits and vegetables. The water pipe system are provided links to fill the bath, creating curtains of water

both on entry and exit of the tunnel, forming cooling shower and rinse the cups moving below the bath.

This kind of scalding device is composed of a bathroom, where the carrier environment, blanchers, equipped with mouthpieces produced perforated duct where holes drilled and its ultrasonic nozzles shows, complete with swirling generator, as well as for the introduction of steam of scalding device.

The bathroom is filled with blanch product (e.g. oil, water, juice or syrup), that is heated up to temperatures of blanching using geothermal water entered through the feed pipe. At the same time the blanch product is loaded into the load-bearers whom he moves along. The steam curls through the vortex generators, being accelerated in the nozzles up to ultrasonic velocity of flow. At the outlet of these nozzles has a turbulent jet detachment steam accompanied by bubble formation and breaking of air. This shot has the shape of a barrel and creates thickening in jumps from of scalding device up to separate waste in bubbles wich are coming out from the area of blanch. Thus, the steam bubbles appear volume pulses and flows that accelerate the process of renovation of the interface between phases. Such intensity of heat exchange, bubbles of steam cools and condenses often accompanied by frequent bursts with supersonic. The permeability of cell membrane of the product is increased on the supersonic oscillations, which are created in the blanched. This allows increasing the speed of movement of the product in of scalding device and efficiency of scalding devices. By the feed product is discharged from blanched being downloaded Download.

RESULTS AND DISCUSSION

As a result of thermal calculation, determine the direct steam consumption, water consumption for cooling and heating surface area of geothermal water of scalding device where blanching is carried out in the solution of salts, water or alkaline solution.

Heat consumption required for heating the product:

$$Q = m \cdot c \cdot (t_2 - t_1)$$

m- the product to be mass heater

c - specific heat of the product

$t_2 - t_1$ - initial average mean temperature of water and final product what heats

Calculate:

scalding device productivity P=6000kg/h sau 1,66 kg/s

the amount of fresh water that is added continuously of scalding device r W=0,01 kg/s

Amount of heat required to heat the product:

Q_1=1,66·3,7·(87 - 23) = 393 kJ/s

The amount of heat consumed in evaporation of water on the surface of the water in the bathroom mirror:

Q_2=3,0·0,173·10^{-6}(60000-3500·0,7)·2202=65,7 kJ/s

The amount of heat consumed to heat water added in the bathroom:

Q_3=0,01·4,19·(90-25) = 2,72 kJ/s

The amount of heat consumed in heating spiral conveyor of scalding device:

Q_4=10,6·0,1·0,48·(90-20) = 35,62 kJ/s

m=10,6·0,1 kg/s, unde v=0,1m/s iar m=10,6kg/m

Heat consumption to heat loss into the environment:

Q_5=10·11,45·10^{-3}(50-25)=2,9 kJ/s

α = 9,7+0,07(50-25)=27,2 W/(m^2·K)=0,0272 kW/(m^2·K)

The total consumption of heat:

Q_{tot}=393+65,9+2,73+34+2,9=499,94 kJ/s

For geothermal water after the calculations:

The total consumption of heat:

Q_{tot}= 341,34+61,5+1,82+25.83+2,3= 432,79 kJ/s

Analysing the calculations we can do a comparison which you present through the following diagram:

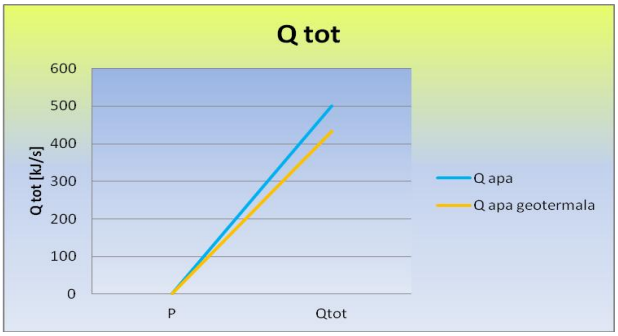

Fig.1. Chart fluctuating depending on the total heat productivity of scalding device water vs geothermal water

From the diagram in Figure 1. It is observed that scalding device needs to blanching the fruits and vegetables, a total heat consumption of 499,94 kJ/s, and scalding device which preheat water with geothermal water, a total heat consumption of 432.79 kJ/s, under the same working conditions..

CONCLUSIONS

The issues raised by the operation and the use of geothermal energy are very current, both in terms of scientific research and of economic efficiency, as well as in terms of teaching, research and support being undertaken of teaching. The heat contained in geothermal fluids can be used anywhere where heat is needed to supplement the heat demand in some processing processes. This is possible if the geothermal fluid temperature and has a sufficiently high pressure, otherwise it can be used only for a certain part of the transformation processes, or as additional heat to cover the needs of heat processes. A large consumer of energy, especially heat, is the food industry. There are a wide variety of prefabrication processes which are carried out with the help of geothermal water for different kinds of foods (fruits, vegetables, grains, sugar, milk, meat, etc.).

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