

SECTION 9. AUTOMATION AND APPLIANCES MAKING

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DETERMINATION OF THE QUALITY OF THE CHOCOLATE MASS PREPARED FOR TEMPERATING AS A CONTROL OBJECT DURING THE PRODUCTION OF BLACK CHOCOLATE

The food industry is a driving factor in the competitiveness of the economy and the economic growth of our country. Because it belongs to the powerful agricultural states. Among food products, chocolate has a proper place. After all, it ranks second in popularity among confectionery products, second only to flour products. This factor contributed to the creation of devices of large unit capacity and continuous processes, as well as the need to automate the production of chocolate [1-2].

The production of slab chocolate is carried out according to the technological process shown in fig. 1. The main stages of which are: bean roasting (cleaning and frying to achieve the characteristic cocoa taste and smell), cracking and winnowing (refining, separation from the shell, crushing), mixing (various components), grinding and squeezing (respectively, the formation of cocoa paste and cocoa butter), conching (removing all residual moisture, eliminating incompatible flavors, aromas, lumps, volatile acids and excessive bitterness) and tempering [3].

Thanks to tempering, the chocolate sets quickly, has a good texture and shine, and is easy to work with. Therefore, the study of determining the quality of the chocolate mass prepared for tempering as an object of control in the production of black bar chocolate is the object of study.

When tempering chocolate, the raw material must be cooled to ensure proper cocoa butter crystallization and uniform distribution of the mixture.

The relationship of the parameters that determine the quality of the chocolate mass prepared for tempering in the tamper chamber will be depicted as a "black box". Due to the definition of input, control and output parameters of the system and disturbing factors, fig. 2.

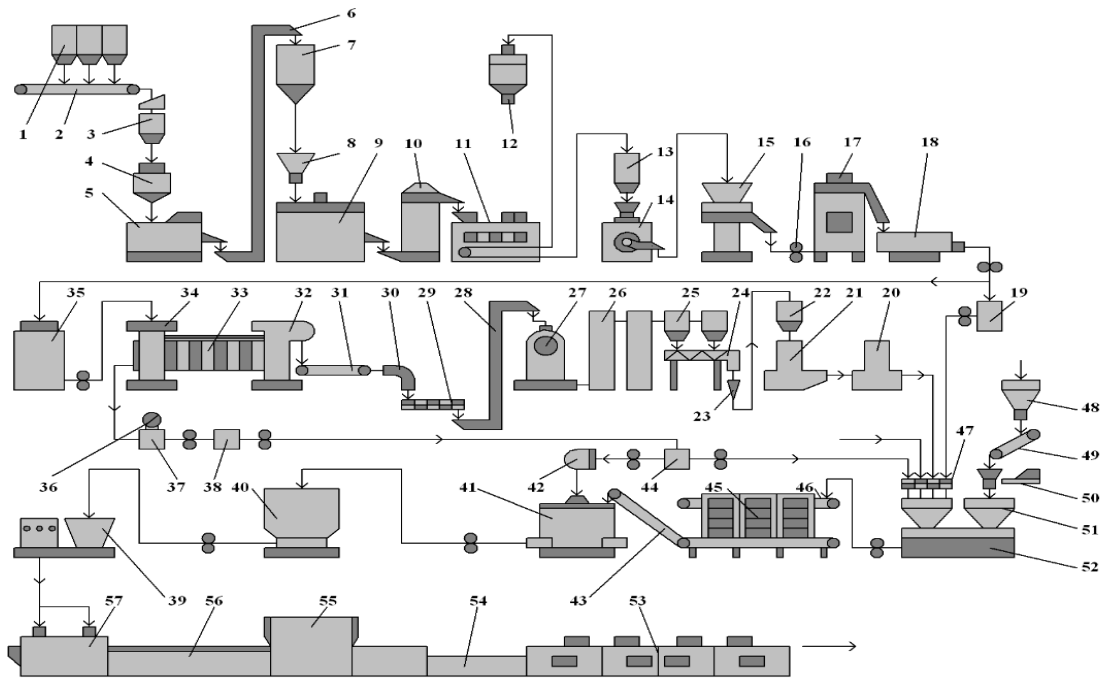


Fig. 1. Scheme of the technological process for the production of black bar chocolate: 1 - bunker; 2 - conveyor; 3 - automatic scales; 4 - bunker-feeder; 5 - cleaning and sorting machine; 6 - elevator; 7 - intermediate bunker; 8 - feeder; 9 - roaster; 10 - elevator; 11 - grinding-cleaning-sorting machine; 12 - cyclone; 13 - bunker; 14 - shock type mill; 15 - disk mill; 16 - pump; 17 - ball mill; 18 - tamper collector; 19 - a collection for making chocolate; 20 - cellophane machine; 21 - packing machine; 22 - collections; 23 - classifier; 24 - auger; 25 - cyclone; 26 - heat exchanger; 27 - type mill; 28 - elevator; 29 - auger; 30 - makuhodobarka; 31 - belt conveyor; 32 - hydraulic press; 33 - working chambers; 34 - dosing capacity; 35 - collection for obtaining cocoa butter, cocoa powder; 36 - scales; 37 - capacity; 38 - filter; 39 - temper chamber; 40 - bunker; 41 - rotary kosh-machine; 42 - dispenser; 43 - conveyor; 44 - collection; 45 - five-roll mills; 46 - conveyor; 47 - dispensers; 48 - bunker; 49 - conveyor; 50 - dispensers; 51 - mill; 52 - prescription-mixing plant; 53 - brewing machine; 54 - belt feeder; 55 - cooling apparatus; 56 - conveyor with molds; 57 - casting machine.

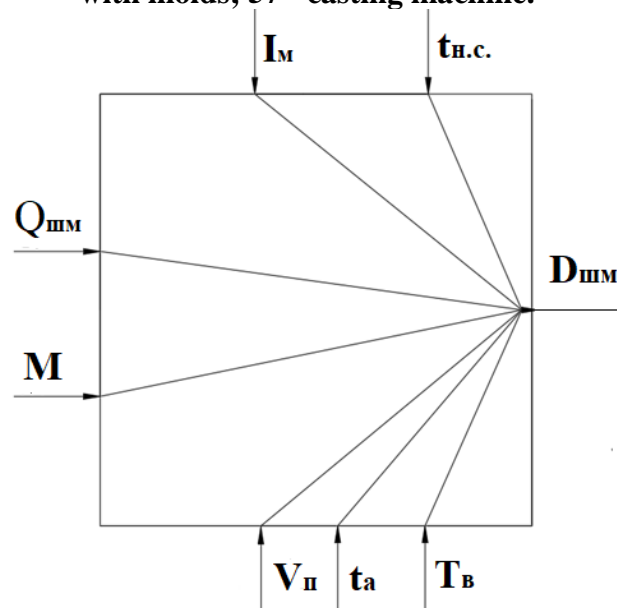


Fig. 2. Scheme of the relationship between the parameters that determine the quality of the chocolate mass prepared for tempering

The input parameters of the system are: $Q_{шм}$ - the quality of the chocolate mass; M - is the mass of the product; weekends - $D_{шм}$ quality of the prepared chocolate mass; control actions: $V_{п}$ - is the stirring speed, t_a - is the temperature of the cooling agent, T_b - is the exposure time; disturbing influences: I_M - current in the network (current fluctuations), $t_{h.c.}$ - ambient temperature.

References:

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