Korean Dairy Technol. 13(1) : 40-45, 1995

BUTTER REWORKING

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Butter blocs processed in butter reworkers fully meet the demand to improve moisture distribution in the reworked butter which result in a longer shelf life of the packed butter. Simultanously, the bacteriological standards are met through the CIP-cleaning.

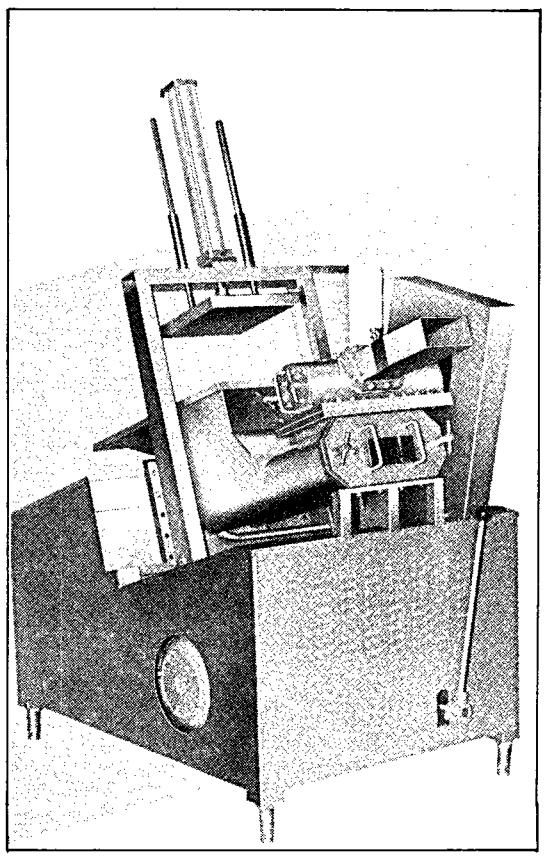
New Technologies

The insufficient moisture distribution in traditional butter bloc reworking machines with knife rotors (see Fig. 1), their outdated technology (only shearing forces, no kneading action) and unsatisfactory bacteriology of the open systems were the reason for developing a new generation of butter reworking equipment.

The prototype of a continuous reworking system for bloc butter (core temperature up to −5℃/22℉) was commissioned in 1988. The completely closed equipment with CIP-cleaning immediately fulfilled the standards mentioned above (see Fig. 2).

The increasingly expensive storage as a result of large tempering halls with their high energy consumption and the demanded flexibility (minimizing of the defrosting time of several days) speeded up the development of a closed, continuous tempering equipment for butter blocs in 1992.

Butter Reworking of Butter Blocks> −5℃/22℉ (see Fig. 3)



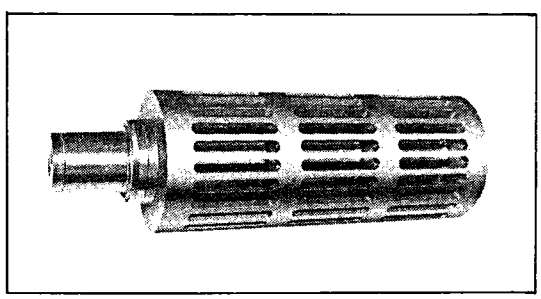


Fig. 1. butter homogenizer
◆ knife rotor

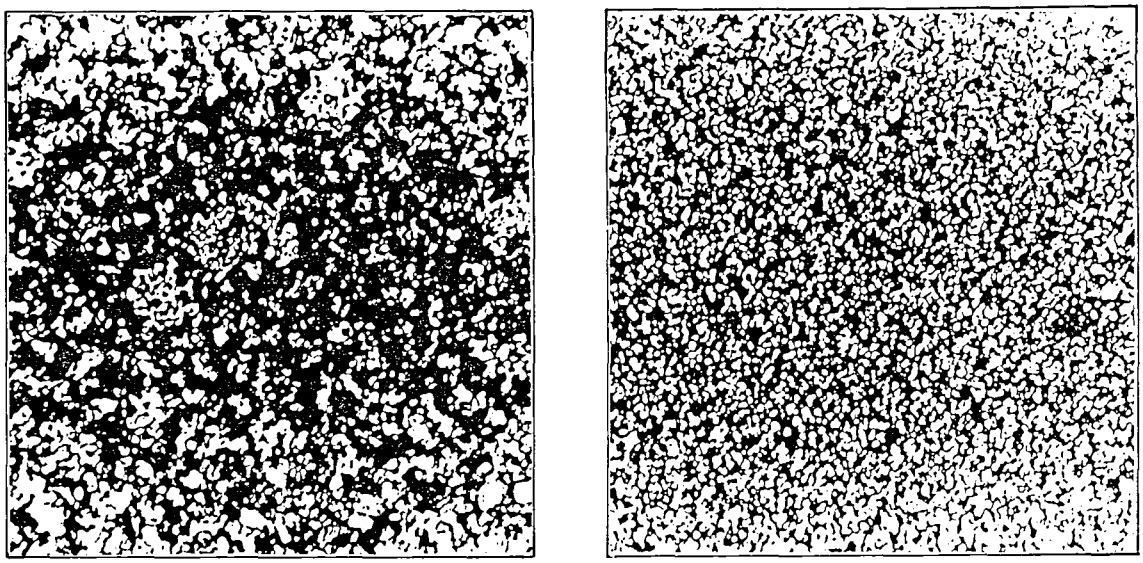


Fig. 2. moisture distribution of butter

◆ without reworker (droplet size > 8μm)

◆ with reworker (droplet size < 3μm)

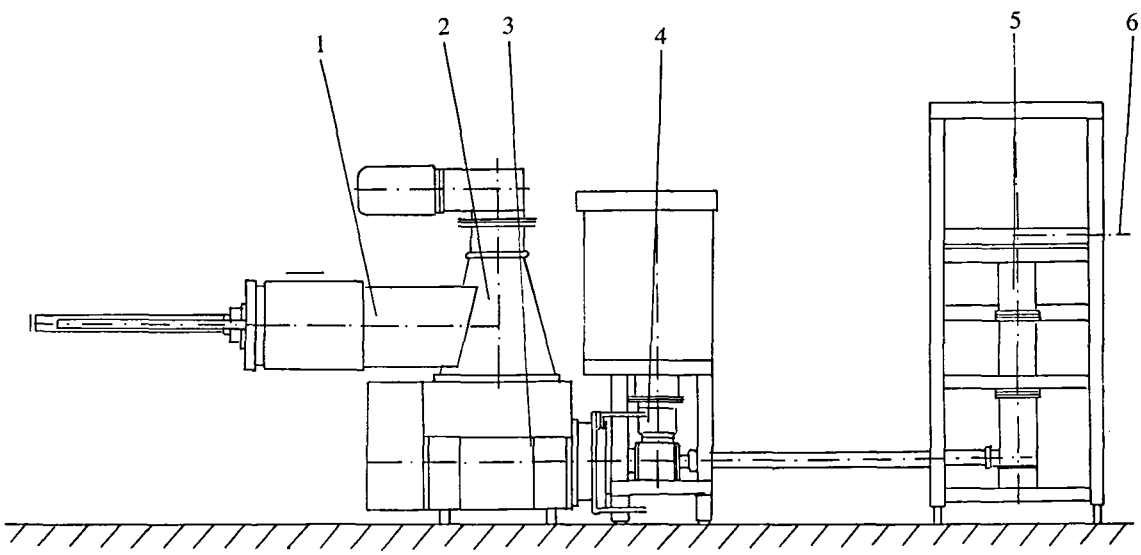


Fig. 3. butter reworking of butter blocs > −5℃ /22℉

1 feeding of butter blocks

2 butter shredder

3 butter transport system

4 butter pump

5 butter reworker

6 butter outlet pipe

The butter blocs are inserted in a bloc feeding device or manually [1] to be transported to the butter shredder [2]. A rotating vertical shredding cone (see Fig. 4) cuts the butter bloc into small chips of about 3″ × 2″ × 1/4″).

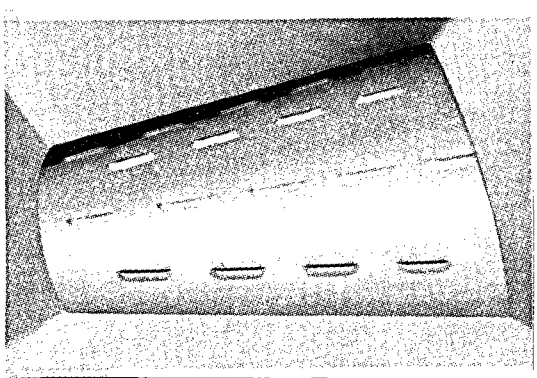


Fig. 4. shredding cone

The butter chips fall into a transportsystem [3] with slowly moving screw converyors with a large diameter. This results in minimal mechanical treatment. The minisilo with its special shape to prevent butter arching even in low temperatures, allows compensation if the butter shredder is not being fed continuously.

In case the moisture content needs to be increased, or if salt, vanillin, herbs or other ingredients wish to be added, these can be sprayed via jet nozzle into the minisilo and/or injected prior to the butter pump.

The butter pump [4] transports the butter through the closed butter reworker [5]. The slowly moving rotors of the butter pump (see Fig. 5) prevent product damage. The precise and solid construction allows the high pressure needed (up to 20 bar/300 psi).

In the butter reworker, the optimal moisture distribution (see Fig. 6) is achieved by two counter-

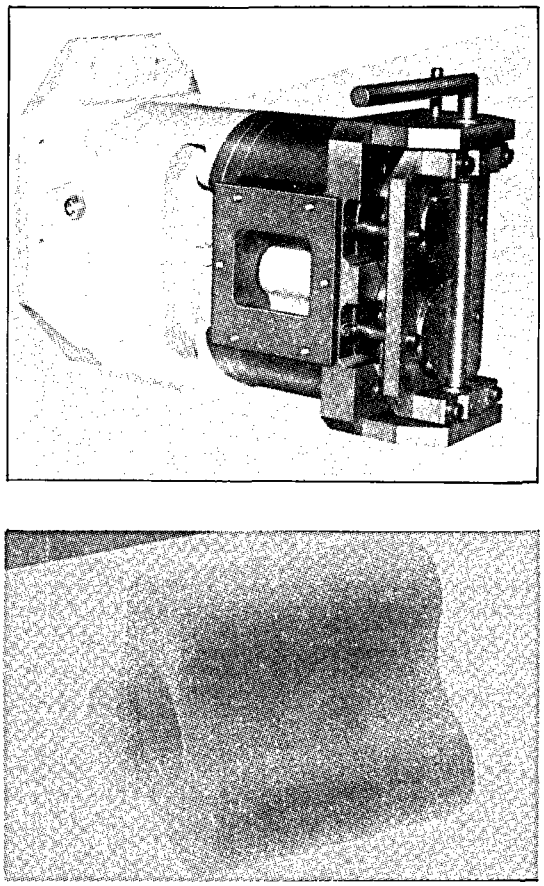


Fig. 5. butter pump
◆ rotor

rotating kneading rollers. The finely distributed moisture droplets (size smaller than 3 μm) guarantee a longer shelf life for the butter. The improved spreadability due to the after-treatment is a welcome side effect. The temperature of the emerging butter is about 6~14℃/42~58℉ (depending on the feeding temperature as well as the regulated treatment intensity). The most important process of the whole butter reworking equipment lies in the kneading process (no conveyor screw elements, no hole plates, no knife rotors → no shearing forces !). The effects are clearly visible in Fig. 2 : A homogenous, grainy, finely distributed structure.

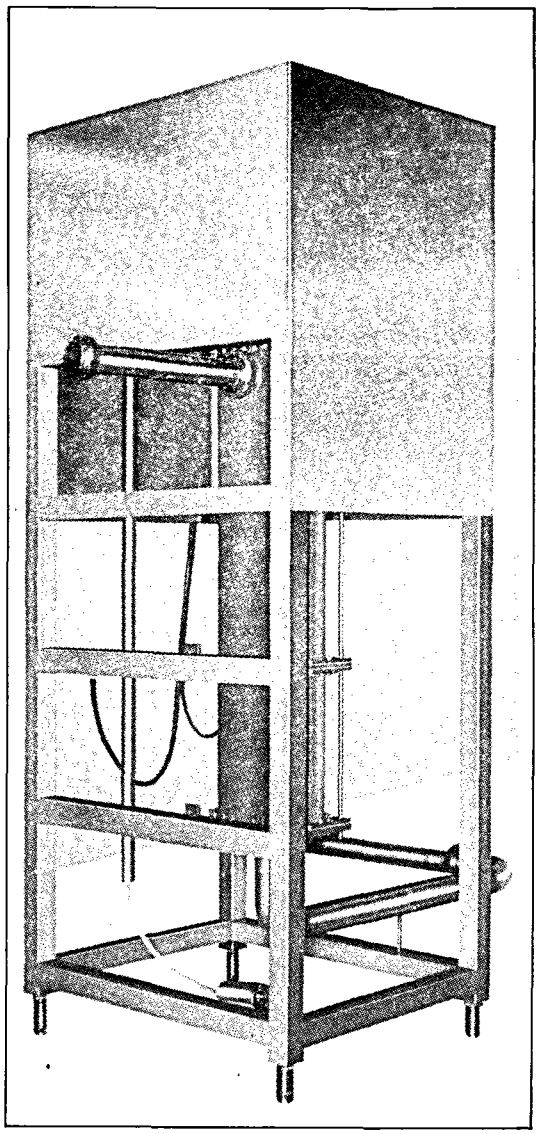


Fig. 6. butter reworker
◆ kneading roller

A PLC-system controls production and CIP-operation. Depending on the amount of butter processed (1,000 to 10,000 kg/h/2,000 to 20,000 lbs/h) the automatization is adapted.

Butter Reworking of Butter Blocs > −25℃/−14℉ (see Fig. 7)

The actual reworking operation works according to the process described above. Only an additional tempering of the frozen butter is necessary for thawing.

It is recommended to integrate an automatic unwrapping and deboxing machine with an additional bloc feeding device, because of low temperatures of the butter blocs and the higher output(3,000~10,000 kg/h / 6,000~20,000 lbs/h).

After the bloc feeding the process operates as follows: The pneumatically driven feeding plate presses the bloc onto the shredding cone (analogous Fig. 4). The butter chips fall into the jacketed tempering system (see Fig. 8) which consists of two jacketed screw conveyors. The great throughput of tempered water within the jacketed elements allows, due to the large surface area, an optimal temperature exchange of the butter. In addition, the integrated slot plates effect a turning of the butter's contact surfaces. The temperature of the emerging butter can be regulated, however experience has shown (e.g. customer's wish) that it is around +2 to +4℃/36 to 40℉.

This tempering equipment can also be used to cool butter which is too soft. Ice water is then used instead of tempered water.

The further process is analogous to the one described above. It includes a butter silo (see Fig. 9), butter pump and butter reworker. The operation

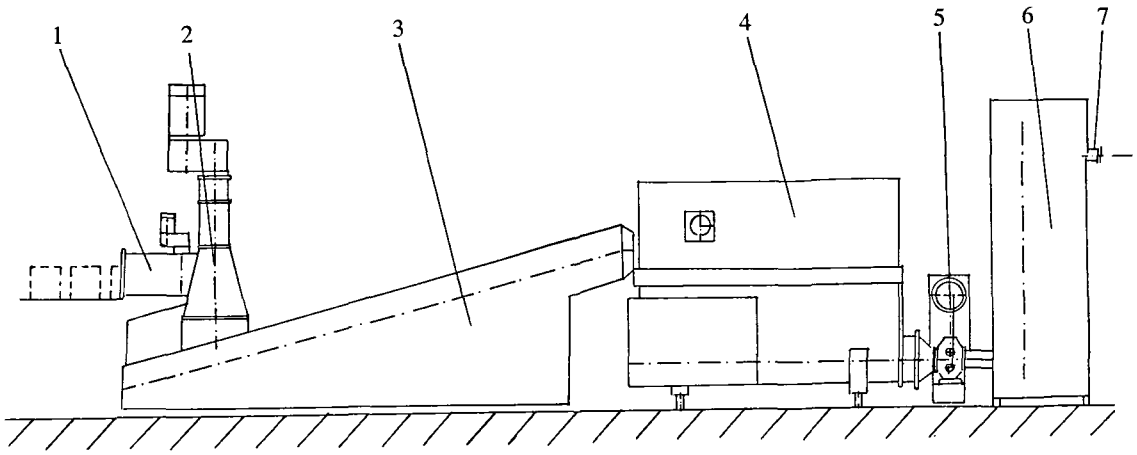


Fig. 7. butter reworking of butter blocs > −25℃ /− 14℉

1 feeding of butter blocks (temperature −25℃)
2 butter shredder
3 butter conditioning conveyer with warm water system
4 butter silo with dosing unit
5 butter pump
6 butter reworker
7 butter exit pipe

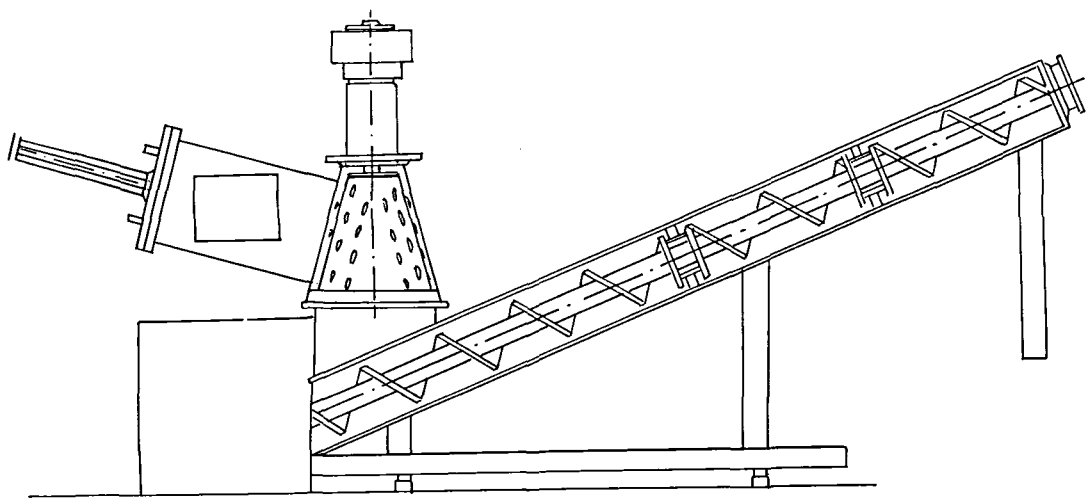


Fig. 8. butter shredder with tempering system

(production and CIP-cleaning) needs to be regulated with a PLC.

Follow-Up Equipment

Depending on the kind and number of wrapping machines, the kneaded, finished butter is transported by the butter pump of the reworking equipment into a butter silo with adequate storage capacity. The

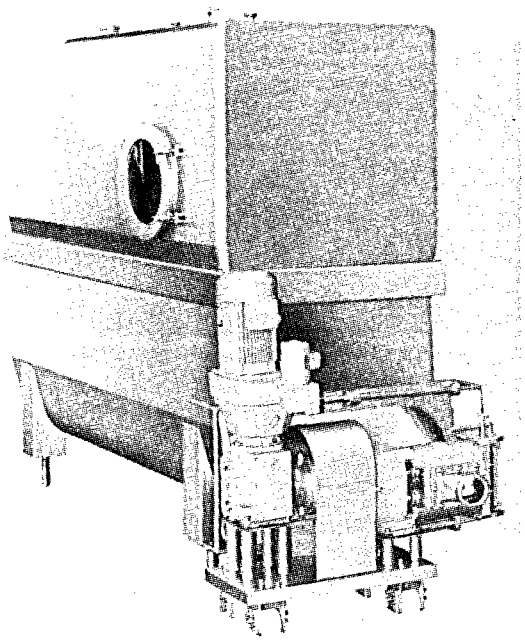


Fig. 9. butter silo

butter silo is fitted with up to five butter pumps. Of course, existing equipment is often integrated.

It order to keep the system completely closed and to fit it into the CIP-system, all the hoppers of the packers are closed with covers or equipped with direct feeding systems (pressure compensation). An optimal adjustment of pumps, piping and compensators as well as a suitable design of the equipment (for gentle transportation of butter) is absolutely necessary in order to prevent layering butter defect.