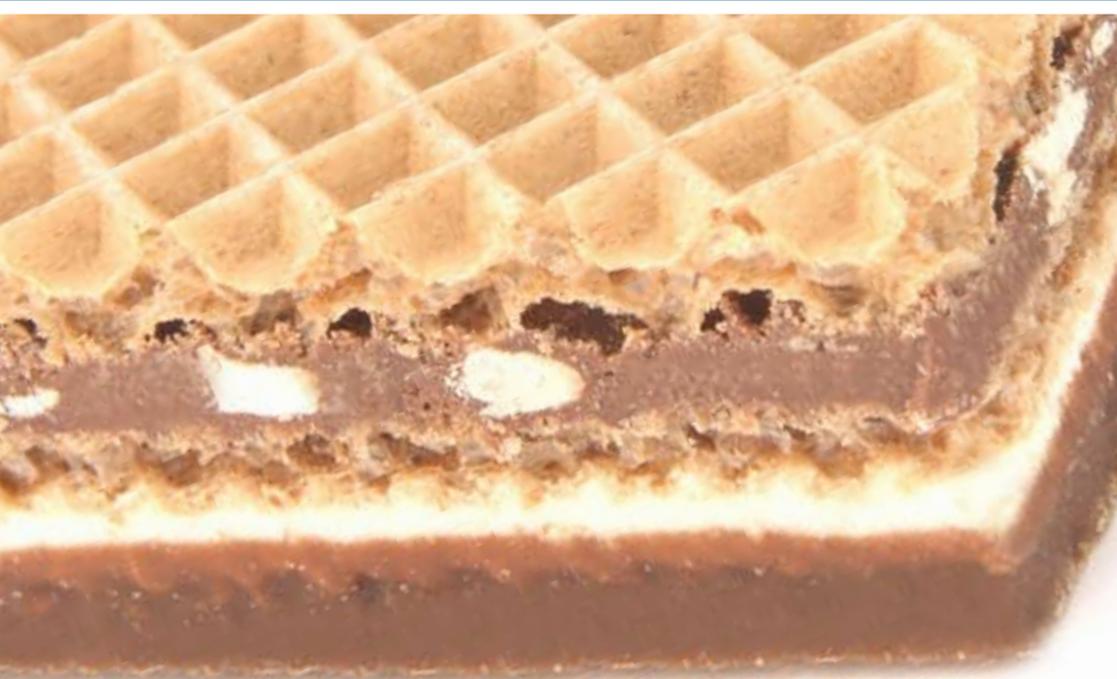




SPX[®]

Continuous On-Site Processing of Bakery Filling Creams



White Paper

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EXECUTIVE SUMMARY

Food companies today are like other manufacturing businesses not only focusing on the reliability and quality of the food processing equipment but also on various services which the supplier of the processing equipment can deliver. Apart from the efficient processing lines we deliver, we can be a partner from the initial idea or project stage to the final commissioning phase, not to forget the important after-market service. SPX Flow Technology has Gerstenberg Schröder installations in more than 110 countries around the world.

INTRODUCTION TO SPX FLOW TECHNOLOGY

VISION AND COMMITMENT

SPX's Flow Technology segment designs, manufactures and markets process engineering and automation solutions to the dairy, food, beverage, marine, pharmaceutical and personal care industries through its global operations.

We are committed to helping our customers all over the world to improve the performance and profitability of their manufacturing plant and processes. We achieve this by offering a wide range of products and solutions from engineered components to design of complete process plants supported by world-leading applications and development expertise.

We continue to help our customers optimize the performance and profitability of their plant throughout its service life with support services tailored to their individual needs through a coordinated customer service and spare parts network.

CUSTOMER FOCUS

SPX Flow Technology develops, manufactures and installs modern, high efficient and reliable processing lines for the food industry. For the production of crystallized fat products like margarine, butter, spreads and shortenings SPX offers Gerstenberg Schröder solutions which also comprise process lines for emulsified food products such as mayonnaise, sauces and dressings.

Today, large bakeries follow the trends of the industrial world such as improved efficiency and ability to meet customers' needs for quality and reliability. When a certain volume per baked product item is reached it is possible to obtain additional cost savings by on-site production as an alternative to purchase and storage of key volume ingredients like margarine, shortening and cream fillings.

Improved economy by savings on the cost of ingredients, in-house control of quality and optimized logistics are some of the advantages achieved by producing margarine and shortenings on-site or in-house.

This article focuses on bakery filling creams. Filling cream is a unique product group since the cream often has to be produced near the filling stations in order to exhibit optimal consistency for the application. Historically, creams are produced batch-wise resulting in varying quality, thus the production and the performance of the cream can be improved considerably by continuous production methods.

Consumers, food technologists and bakers all have different conceptions of "creams". Among the industrial bakeries the word cream commonly describes a mixture of fat, sugar and perhaps additional components like cocoa powder, milk powder - or sometimes even water. In practice, the bakeries often do not differentiate between relatively hard fat and sugar mixtures and softer mixtures containing water. However, when the processing line is designed large differences occur in respect to choice of e.g. pumps and scraped surface heat exchangers (SSHE) from one product to another.

Creams used in bakeries can be grouped as listed below and the choice of processing equipment will depend on which category the cream belongs to.

HEAVY CREAMS

- 20-35% fat, higher melting point
- 65-80% dry ingredients, mainly powdered sugar
- no water
- typical products: sandwich cream, biscuit cream

The sandwich cookie cream falls into the heavy cream group. The process challenge of this application is the high amount of sugar (50-70% fine sugar) to be dispersed into the high melting fat mixture. The ability of the cream to set or firm up shortly

after the filling onto the cookie is required as the cream applies mechanical stability by holding together the two cookies. The crystallization of the fat mixture is controlled in such a way that part of the crystallization takes place immediately after the filling process.



Liquid oils and solid fat in specific ratios are melted, mixed with sugar and then quickly cooled in the SSHE. The crystallization process is among other things dependent on temperature and time and can be controlled in the processing line, in the SSHE and in the pin rotor machine.

It is recommended to use a high pressure SSHE such as a GS Perfector or a GS Kombinator plant as shown in figure 1 for the production of a heavy cream. This line can handle high pressure and high motor shaft torque applied by the product which often is firm and an abrasive suspension with poor flow properties. The line is a compact skid-mounted unit with direct connection to the filling machine in order to minimize the potential setting of the cream in the line, which can result in production halts. Typical production capacities cover 500-1,000 kg/h per skid-mounted unit.

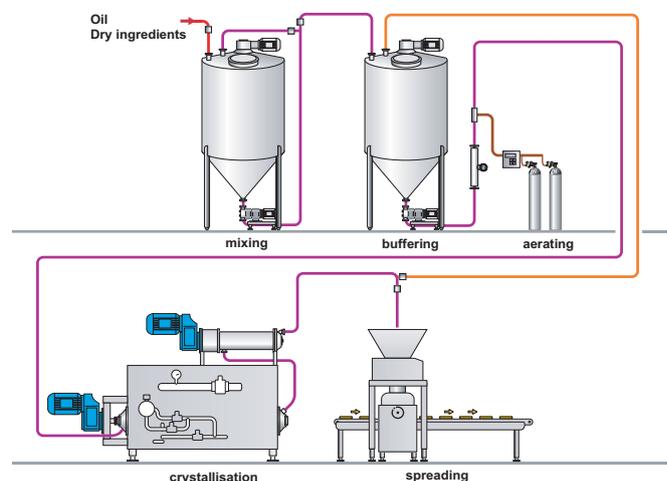
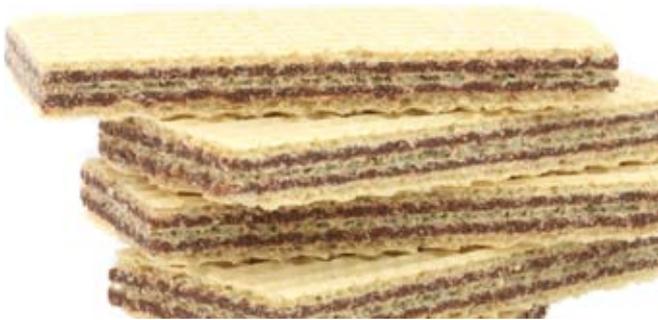


Figure 1: Outline for the heavy cream production

LIGHT FILLING CREAMS

- 20-35% fat, lower melting point
- 65-80% dry ingredients, mainly powdered sugar
- no water
- typical products: wafer creams, chocolate bars or biscuit fillings, dough improver mixed with fat, nougat paste, chocolate coverings



The wafer application requires slightly softer cream with the ability of holding together multiple wafer layers. The manufacturing process is similar to the one of heavy creams as the lines should be able to handle abrasive product but under moderate pressure. Depending on the composition of the cream and the desired capacity, either one of the GS Kombinator or GS Perfector can be used.



GS Kombinator 250



GS Consistator® MD

LIGHT FILLING CREAMS WITH WATER

- 0-40% fat, lower melting point
- 20-60% dry ingredients
- 15-70% water
- typical products: fresh creams, fillings for chocolate bars or biscuits, rolled or filled snack cakes



These very soft creams are typically used for rolled or filled snack cakes. The manufacturing process shown in figure 2 includes emulsion preparation, pasteurization and crystallization of the relatively fluid cream. For this application the SSHE GS Consistator® MD is recommended. All of the described creams can be aerated with nitrogen or air to meet various texture requirements, for calorie reduced application or for cost saving reasons.

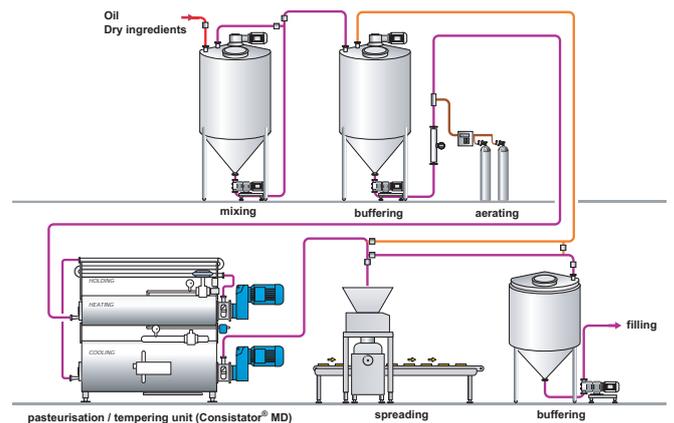


Figure 2: Outline for production of light filling creams with water

TYPE OF PRODUCT	HEAVY CREAM	LIGHT CREAM	LIGHT CREAM WITH WATER
CHARACTERISTICS	20-35% HIGH MP FAT	20-35% LOW MP FAT	15-35% LOW MP FAT
	NO WATER	NO WATER	15-70% WATER

MACHINE TYPE	GS KOMBINATOR	GS KOMBINATOR/ GS PERFECTOR	GS CONSISTATOR [®] MD
CONSTRUCTION CONCEPT	HEAVY DUTY, HIGH TORQUE	HEAVY DUTY, HIGH TO MEDIUM TORQUE	MEDIUM DUTY, MEDIUM TO LOW TORQUE
REFRIGERANT RECOMMENDATION	GLYCOL	GLYCOL/AMMONIA	GLYCOL/AMMONIA
SCRAPERS	ROWS OF FLOATING SCRAPERS DEPEND ON EQUIPMENT AND APPLICATION		
SEALS	FLUSHED SEALS	FLUSHED SEALS	FLUSHED SEALS
PUMP	HEATED LOBE PUMP	HEATED LOBE PUMP	HEATED PROGRESSING CAVITY PUMP
CAPACITY VARIABLES	PRODUCT CHARACTERISTICS, COOLING SURFACE, COOLING MEDIA, RPM, ANNULAR SPACE, SCRAPERS		
MACHINE SELECTION	CHILLING TUBES: PLATED WITH HARD CHROMIUM STEEL. SCRAPERS: SPECIAL HARDENED CORROSION-RESISTANT MATERIAL		ROTOR AND CHILLING TUBE IN ENHANCED STAINLESS STEEL

Table 1 illustrates the three different equipment choices depending on type of cream.

PRODUCT FUNCTIONALITY AND QUALITY

The functionality and the quality of the cream depend on the application and differ accordingly, but in general bakery creams are described in relation to the following properties:

- Texture
- Sweetness
- Adhesion (in sandwich or rolled snack cake applications)
- Firmness (to suit different climatic distribution conditions)

PILOT PLANT TRIALS

SPX Flow Technology offers and recommend the performance of pilot plant tests for cream formulations as there are no real standard solutions for the cream application due to the fact that ingredients differ from product to product and from producer to producer. The amount and fineness (granular size) of sugar and other dry ingredients as well as the type of fats used and the crystallization behavior contribute to the high viscosity of the cream and hereby affect the choice of materials and design of the plant.

PROCESS CONTROL GS LOGIC

The GS Logic system is designed to control, record and document important parameters concerning the complete manufacturing process. The system helps to improve plant performance by creating a consistent processing environment.

Compared to batch processes, the continuous Gerstenberg Schröder process offers not only cost savings in labor and logistic but also various process and product benefits. The mixing is done efficiently, the process control is easy and can be altered to meet a wide range of cream recipes and consistencies (texture properties), the quality is consistent and uniform and the hygiene is improved.



The GS Logic is easy to operate and gives an excellent overview of the complete production line.



ABOUT SPX

Based in Charlotte, North Carolina, SPX Corporation (NYSE: SPW) is a global Fortune 500 multi-industry manufacturing leader. For more information, please visit www.spx.com.

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