Processors' Guide & Formulations

Dairy Dips & Spreads

Market Landscape
Ingredients and Functionality
Standards and Regulations
Processing Principles
Starter Formulations, Scaling Up
Trouble Shooting

Prepared for the Pacific Coast Coalition by the California Dairy Innovation Center, October 2024.

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Market Expectations

COMPETITIVE LANDSCAPE: FOR THE LATEST MARKET INFORMATION CONTACT CDIC.NET

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Dairy Ingredient Functionality

DAIRY CHOICES

MPC/MPI

WPC/WPI

Fluid Milk

Cream

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Dairy Ingredient Functionality

FUNCTIONAL DIFFERENCES

	Fluid Milk	MPC	MPI	WPC	WPI	Cream
Pros	• Creaminess • Flavor Mild • Moisture • Nutrient Rich	• Cost Effective • Enhanced Texture • Natural Flavor	• Higher Protein • Reduced lactose • Improved Stability	• Cost Effective • Higher Lactose • Natural Flavor	• Higher Protein • Lower fat and carb • Lower lactose • Neutral flavor	• Rich flavor • Creamy texture • Emulsification • Versatile
Cons	• Not for lactose intolerant • Separation Issues • Shorter Shelf Life • Inconsistent fat level	• Higher Lactose • Potential off Flavors • Lower protein content	• Higher Cost • Lack milk flavor • Can become bitter	• Lower protein content • Higher fat and carb content	• Higher Cost • Bitterness • Reduced milk flavor	• Fat High • High Calorie • Short shelf life

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Labeling, Regulatory, Packaging

STANDARD OF IDENTITY

- What Is a **Dip**? A dip is a creamy, chunky, or saucy mixture of complementary ingredients into which you can dip finger foods like chips and crackers. Dips have various consistencies, from fresh, chunky options like salsa to creamy textures like guacamole, artichoke dip, or seven-layer dip.

- A **spread** is a food that is spread, generally with a knife, onto foods such as bread and crackers. Spreads are added to food to enhance the flavor or texture of the food, which may be considered bland without it. Butter and soft cheeses are typical spreads.

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Labeling, Regulatory, Packaging

REGULATORY CONTINUED

- CFR 21 Part 133 Covers Cheese By Products
  - 133.133 Cream Cheese
  - 133.175 Pasteurized Cheese Spread
  - 133.178 Pasteurized Neufchatel Cheese Spread
  - 133.179 Pasteurized Process Cheese Spread

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Scale Up and Commercialization

PROCESSING TYPES

Thermal Treatment

- HTST (High Temperature Short Time)
  - 72C for 15 seconds
  - Packaging: Glass Bottle/ Metal/Plastic Tub
  - Produce large volumes, increase energy efficiency, minimize contamination
  - Can help retain color and flavor but has caramelized notes

- LTLT (Low temperature Long Time)/Vat Pasteurization
  - 63C for 30 min.
  - Packaging: Glass Bottle/ Metal/Plastic Tub
  - Preserves nutrients, better flavor, lasts longer refrigerator

- Ultra Pasteurized
  - 138C for 2 seconds
  - Packaging: Cartons
  - Shelf Stable if packed aseptically

Fermentation

Can be fermented with Lactic acid bacteria, yeast or kefir
Adds flavor and texture

Homogenization

Increases smoothness by reducing particle size of whey protein aggregates

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Scale Up and Commercialization

CHEESE SAUCE PROCESSING

- Typically contains high amount of casein
  - Emulsifying Salts = To break it down emulsifying salts are used to bind the casein so that it becomes soluble and produces an ooey gooey sauce
  - Salt = is also added which can promote aggregation but also adds flavor
  - Acids and Flavors = added to optimize flavor and adjust pH
  - Oils = Can play a role in modifying stability of the system and binding to the calyx of the protein
  - Starches = can also form a network and prevent proteins from interacting, important to choose a starch with the right amylose: amylopectin ratio

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Scale Up and Commercialization

CHEESE SAUCE PROCESSING CONT'D.

Mix Ingredients

- Focus on order of addition for proper distribution of dry ingredients, and rehydration

Homogenize

- Shear Pump or Microthermics

Pasteurize [Laydown Cooker is typically used]

- 89C for 5 min, ramp up roughly 30 min
- Shearing can affect hydration and starch system

Package

Cool

- Cool to 4C within 1 hr.

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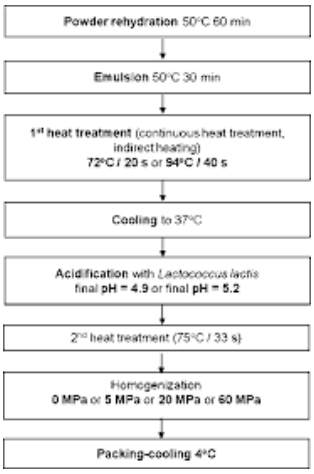
Scale Up and Commercialization

General Process for Cream Cheese Spread

Important Steps and Considerations:

1. Inoculation of the culture and incubation time has a large affect on texture and flavor of the cream cheese spread
2. Homogenization plays a key role in smoothing cream cheese and fineness of the meltdown
3. When mixing shear can have a huge effect on final texture once set of the cream cheese
4. Allow product to age



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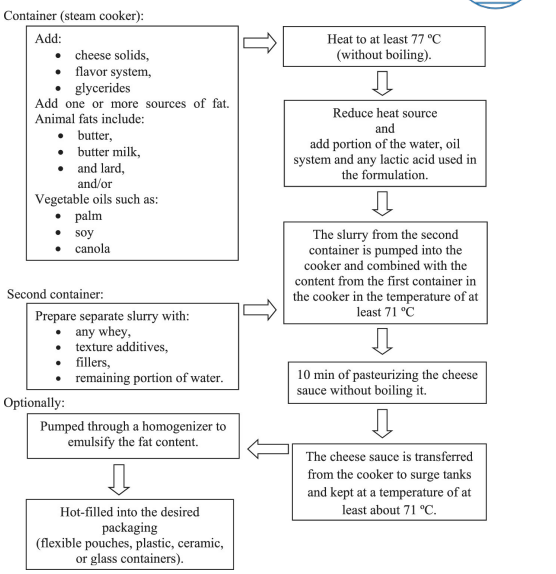
Scale Up and Commercialization

General Process for Cheese Dip



Source

Important Processing Information:

1. Typically can use a steam jacketed kettle or laydown cooker
    1. When using these pieces of equipment monitor moisture and viscosity as there is typically inconsistent water loss
2. Make sure to monitor thickness of the product prior to cooling.
    1. Once product cools viscosity could increase

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Scale Up and Commercialization

NEXT STEPS

1. Perform a pilot trial at a CMO (Contract Manufacturer or lab facility)
2. Perform a consumer testing study
3. Start shelf-life study
4. Determine your cost of goods (COGS) t determine financials and overall cost per unit and margins
5. Secure vendors and suppliers and obtain lead times for supply. This will enable you to develop a timeline to commercialization.
6. Determine your distribution options and where you want to launch (regional vs. national)

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Troubleshooting

TANAKA GUIDELINES

- For cheese sauces or dips
- Published in 1986 in the Journal of Food Protection, 49, 526-531
- Developed a method to help control against C.Botulinum
  - C.Botulinum is a gram positive anaerobic bacteria that produces spores that contain lethal toxins. They can survive in low pH conditions and high temperature up to 121 C
- High Moisture (60% moisture) requires high salt content and low pH
- Applies mainly to shelf stable and refrigerated products

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Troubleshooting

PROTEIN CONSIDERATIONS

- Casein very heat stable
- Whey not heat stable (must create the right environment, i.e formula) but has greater solubility
- Ensure you are considering pH for each protein
- Use of MPC high exposure to heat can lead to gelation, make sure you watch the temperature and monitor the products even weeks after processing.
  - Could also slow down casein aggregation by adding polyphosphate

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Troubleshooting

INGREDIENTS

- Dairy Base
- Fat Levels
  - For creaminess and richness
- Cheese Type
  - Aged Cheese can have shorter protein chain and pose less opportunity for interactions, product becomes less stable
- Preservatives
  - Sodium benzoate and potassium sorbate can extend shelf life
- Thickening Agents
  - Such as gelatin, gums, carrageenan for desired consistency
- Emulsifying Salts
  - Be sure to add the correct emulsifying salt and quantity to bind the casein protein to calcium ions and produce homogenous product
  - Works by replacing the calcium ion on the casein with sodium

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Troubleshooting

PHASE SEPARATION

- Main Issue:
  - High fat dairy can lead to separation post-processing
- Solution:
  - Emulsifiers
    - Incorporation of emulsifiers such as lecithin or mono/di glycerides can stabilize mixture and help prevent separation
  - Particle Size Reduction
    - Homogenization reduces the size of particles and can make the texture a lot smoother
  - Thickening Agents
    - Using gums and or carrageenan can increase viscosity and help prevent separation

TEXTURE

- Main Issue:
  - Keeping texture creamy, smooth can be difficult.
  - Product can become gritty or chunky
- Solution:
  - Blending
    - Blending ingredients carefully in dry state can be helpful as well as slow and shear incorporation of dry ingredients into wet
  - Temperature Control
    - Maintain optimal temperature to prevent excessive thickening of product overall
  - Aging
    - Giving the product time to age can help to develop better texture and flavor

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Troubleshooting

SHELF STABILITY

- Main Issue:
  - Ensuring same texture and flavor throughout products shelf life can be challenging

- Solution:
  - Adding Preservatives
    - Blending ingredients carefully in dry state can be helpful as well as slow and shear incorporation of dry ingredients into wet
  - Choosing packaging
    - Proper packaging can protect the product from contamination, abuse, and microbial contamination
    - Ensure proper sealing to promote an oxygen free environment
  - Proper Storage
    - Proper storage without too much fluctuation in temperature can optimize overall product integrity

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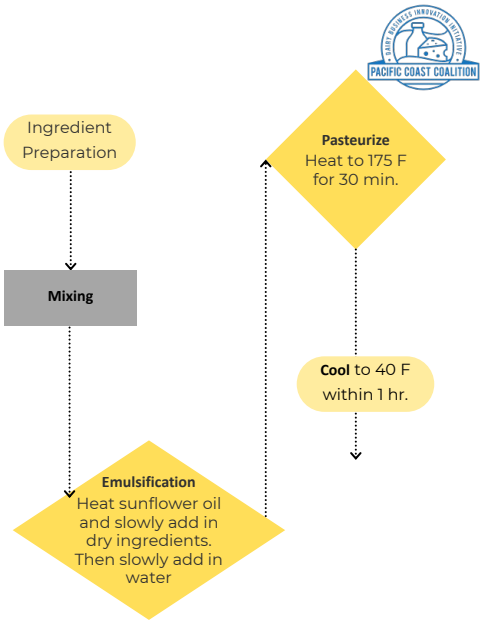
Starter Formulas

FRENCH ONION DIP

	French Onion Dip	Purpose
Water	73.1%	Hydrate dry ingredients
Sunflower Oil	15%	Texture
Onion	5%	Flavor
Whey Protein Concentrate	2.5%	Emulsifier, Protein Source
Modified Starch	1.8%	Stabilizer
Salt	1%	Buffering
Sugar	0.8%	Flavor
Onion Powder	0.5%	Flavor
Lactic Acid	0.2%	Flavor and pH adjustments
Xanthan Gum	0.1%	Stabilizer



pH target 4.0-4.5
Pasteurization Temperature: 167-185F

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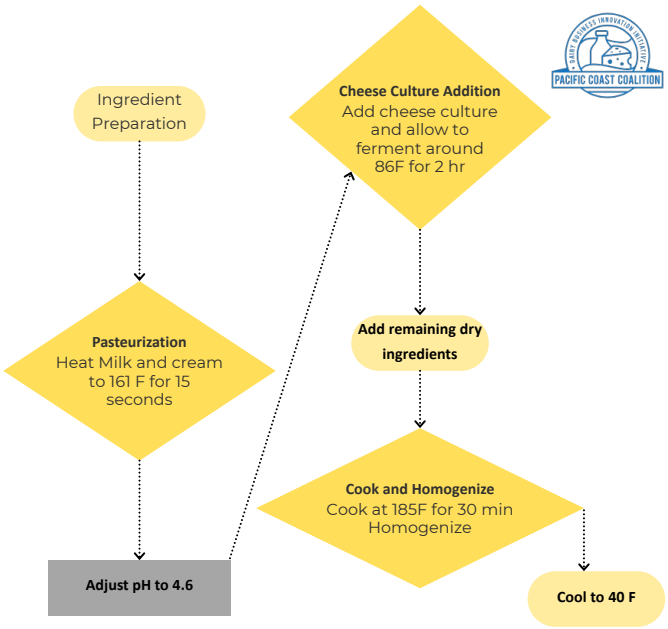
Starter Formulas

CHEESE SAUCE

	Cream Cheese	PURPOSE
Milk	81.2%	Flavor, and Base
Cream	15%	Body
Whey Protein Concentrate	2%	Emulsifier
Salt	0.5%	Flavor
Carob Bean Gum	0.02%	Stabilizer
Natamycin	0.3%	Mold Inhibitor
Vitamin A	0.3%	Antioxidant
Cheese Culture	0.2%	Fermenter



pH 4.6-4.8
Use HTST : 161 F for 15 seconds

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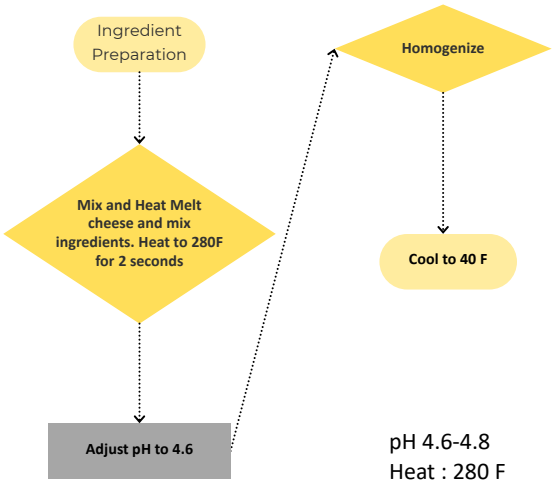
Starter Formulas

CHEESE SAUCE W/ CHEESE BLOCK

	Cream Cheese	PURPOSE
Milk	81.2%	Flavor, and Base
Cream	15%	Body
Cheese	5%	Emulsifier
Sodium Phosphates	0.5%	Emulsifying Salts
Salt	0.5%	Flavor
Carob Bean Gum	0.02%	Stabilizer
Natamycin	0.3%	Mold Inhibitor
Vitamin A	0.3%	Antioxidant



pH 4.6-4.8
Heat : 280 F

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Market Expectations

MARKET SIZE

- This market is valued at USD 90.2 billion in 2022 and is estimated to grow at over 5.4% CAGR from 2023 to 2032.
- Growth during pandemic (home comfort foods) and post pandemic (parties and get-togethers).
- "Recession-proof", more at home cooking with use of dips and spreads. At home cooks are becoming more creative and incorporation of dips and spreads in dishes is increasing.
- Options are diverse with bases made from Greek yogurts, hummus, cream cheese, and tzatziki

* Mordor Intelligence data

** Data Bridge Market Research

Dips

A thick sauce where pieces of food are dunked

Creamy mixture made with dairy ingredients

Spreads

Soft spreadable cheese or processed cheese

Cream Cheese Spread: saltier more spreadable version usually sold in tubs

- Regulated by FDA, pasteurized unaged dairy product that contains 33% milkfat with moisture of up to 55%, and has pH 4.4-4.9

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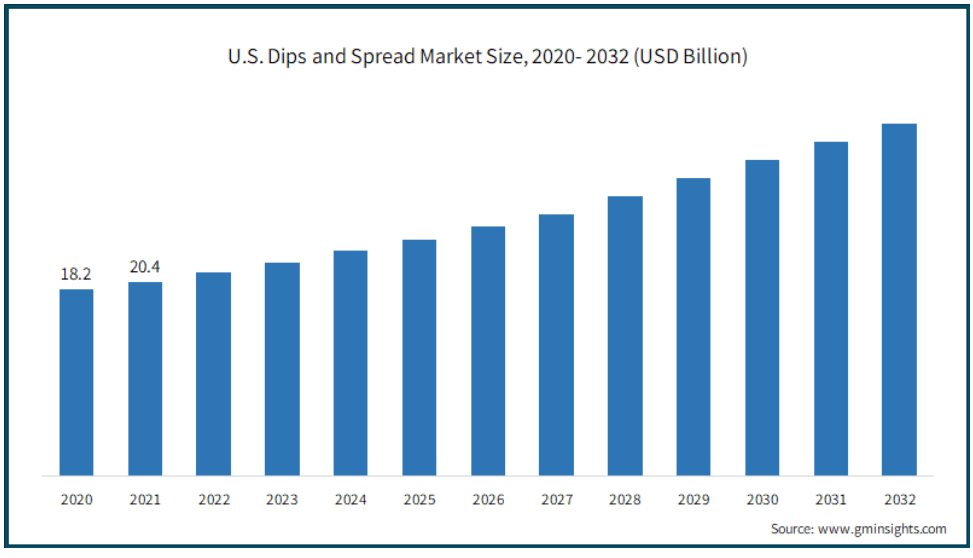
Market Expectations

MARKET SIZE



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Market Expectations

CONSUMER SEGMENTATION

- Older millennials and Gen X drive the category
- Post pandemic activities – gatherings and parties generate more sales
- Category leaning towards clean label, better nutrition and eating healthier snacks
- Ethnic cuisine flavors (Mediterranean, Hispanic, Middle Eastern)
- Discretionary dollars for a “better for you” snack treat

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For more information please consult www.dairypcc.net

The PCC-DBII is part of a national initiative to help the dairy industry address ongoing supply chain and food system challenges by offering resources for: Business plan development, Marketing and branding, and Increasing access to innovative production and processing techniques to support the development of value-added products.

This initiative currently operates in six states — Arizona, California, Nevada, New Mexico, Oregon, and Washington — and is supported by collaborative partners and grant funding which will make more than $11.4 million available to regional dairy businesses for innovation-related investments.

Additional information for California processors and entrepreneurs available at www.cdic.net

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