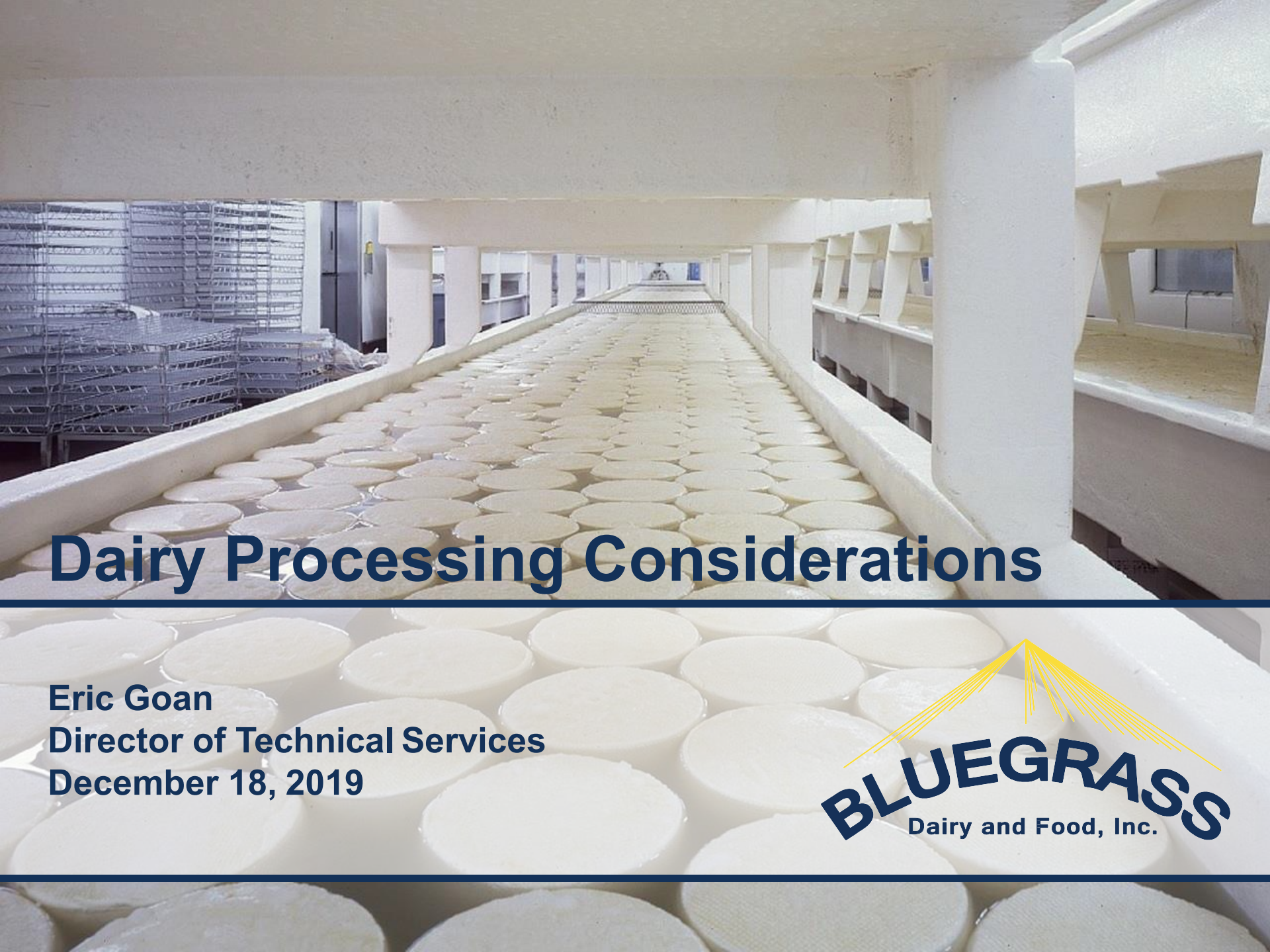

Dairy Processing Considerations

Eric Goan
Director of Technical Services
December 18, 2019

BLUEGRASS
Dairy and Food, Inc.

Pre-requisites to Processing

- Background
- Bluegrass Dairy and Foods Inc.
- Considerations
- Getting Started
  - Requirements
  - Regulations
- Production
- Quality Assurance/Regulatory

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Background

- Raised on Dairy Farm and Processed Own Milk
- Bachelors, University of Tennessee
  - Food Science & Technology
    - Business & Engineering Concentration
- Masters, University of Tennessee
  - Food Science & Technology
    - Chemistry & Sensory Concentration
- University of Tennessee
  - Research Associate and Extension Specialist Dairy Processing
- Mississippi State University
  - General Manager of Dairy Operations
- Bluegrass Dairy and Foods Inc.
  - Director of Technical Services

Bluegrass Dairy and Foods Inc.

- Founded in 1995
- Utilizes in-house award winning cheeses into production of our cheese powders
  - Over 600 stock items
  - Formulate specifically for the customer
  - Dairy and Non-Dairy
- 2 production facilities, and R&D Innovation Center
  - Glasgow, KY (Corporate HQ)
  - Springfield, KY (Innovation Center)
- Director of Technical Services
  - R&D, Innovation, Regulatory (Domestic and International), Technical Sales, Plant Engineering, and Sales

BLUEGRASS Dairy and Food, Inc.

Bluegrass Dairy and Foods Inc.

- Food Ingredients
  - Specialty Powders
    - Fruit
    - Shortening
    - Pareve
    - Non-Dairy Creamers
  - Dairy Powders
    - Cheese
    - Cultured Dairy
    - Other Dairy
    - Grass-Fed
  - Commodity Powders (LTL Only)
    - Whole Milk
    - Non-Fat Dry Milk

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Considerations Prior to Starting

- Considerations
  - Are you sure this is something you want to do?
  - Talk to other producers
    - Visit their facility
      - Would they change anything?
      - Keep in mind you may not be approved for the exact same set up.
    - Commitment to the dairy
    - Advantages and disadvantages
    - How hard and competitive is marketing the product?
    - If they had to do over would they begin processing?
    - What does it cost to process a gallon/pound of product?

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Considerations Prior to Starting

Sources of Milk

Table 1. Gross Composition (%) of Milk from Domesticated mammals					
Species	Fat	Protein	Lactose	Ash	Total Solids
Cow					
Ayshire	4.1	3.6	4.7	0.7	13.1
Brown Swiss	4.0	3.6	5.0	0.7	13.3
Guernsey	5.0	3.8	4.9	0.7	14.4
Holstein	3.5	3.1	4.9	0.7	12.2
Jersey	5.5	3.9	4.9	0.7	15.0
Goat	3.5	3.1	4.6	0.8	12.1
Sheep	5.3	5.5	4.6	0.9	16.3

Park, YW and Haenlein, GFW. Handbook of Milk of Non-bovine Mammals. Blackwell Publishing.

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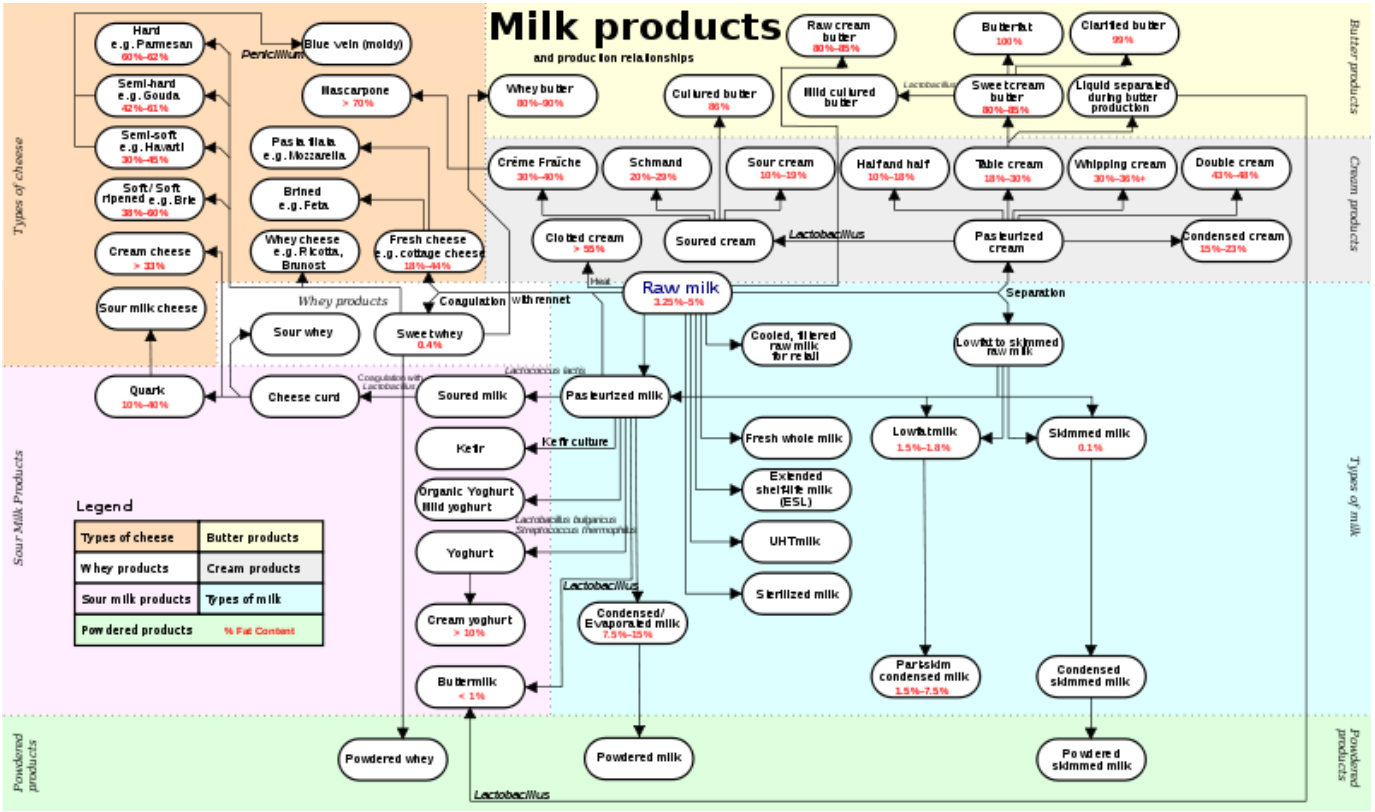
Considerations Prior to Starting



http://commons.wikimedia.org/wiki/File:Milkproducts.svg

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Considerations Prior to Starting

- Considerations
  - Processing Classes
    - Learn processing and lab techniques
    - Sensory properties
  - Co-Packers
    - Starting Point

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Getting Started

- Requirements
  - Pre-Construction
    - Meet with State and Local Inspection Services
      - Approval Process
    - Meet with Local Extension Service, University that Supports Dairy Processing Industry, Consultant or Expert
    - Location and Real Estate Zoning
    - Available Utilities
      - Electricity
      - Water
      - Natural Gas
      - Sewer

BLUEGRASS Dairy and Food, Inc.

Getting Started

- Requirements
  - Typical Order of Approval Process
    - Site Approval (State Inspection Service)
    - Facility Approval (State Inspection Service)
      - Waste Water (State Environmental)
      - Potable Water (State Environmental)
      - Septic Tank (Health Department)
      - Direction of all facility Drains (State Inspection Service)
    - Equipment Approval (State Inspection Service)
      - Prior to Purchase and Installation
      - After Installation
    - Plant Layout and Design Approved (State Inspection Service)
    - Approved Lab (State Inspection Service)
    - Special License (State Inspection Service)
      - Plant Permit
      - Hauler/Sampler License
    - Chemical Approval (State Inspection Service)

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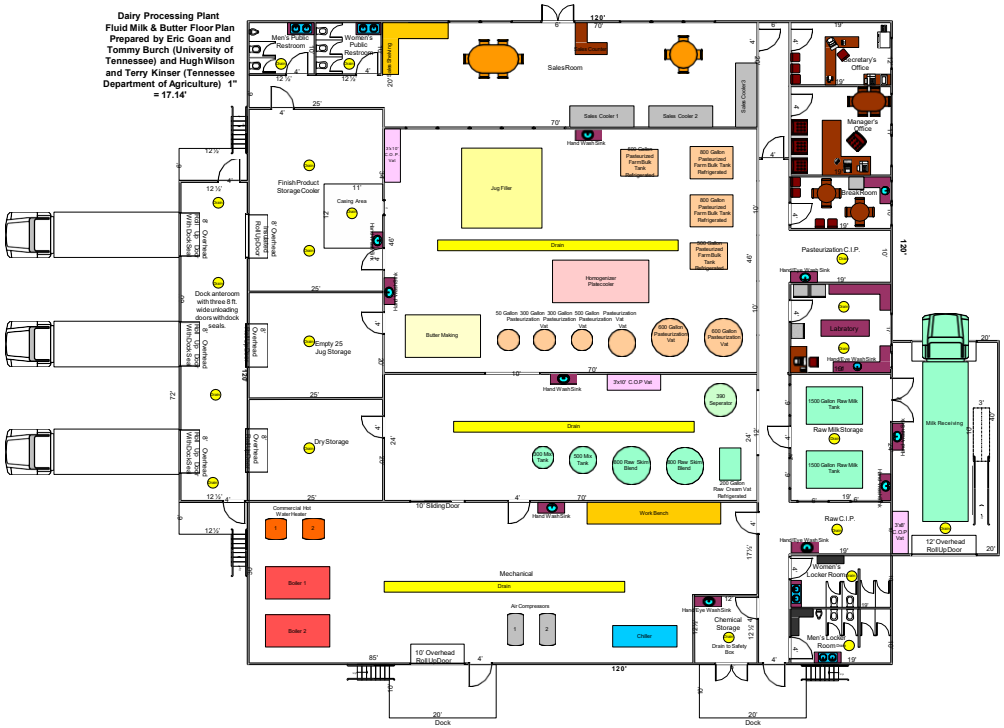
Getting Started

- Dairy Plant with Batch Pasteurization



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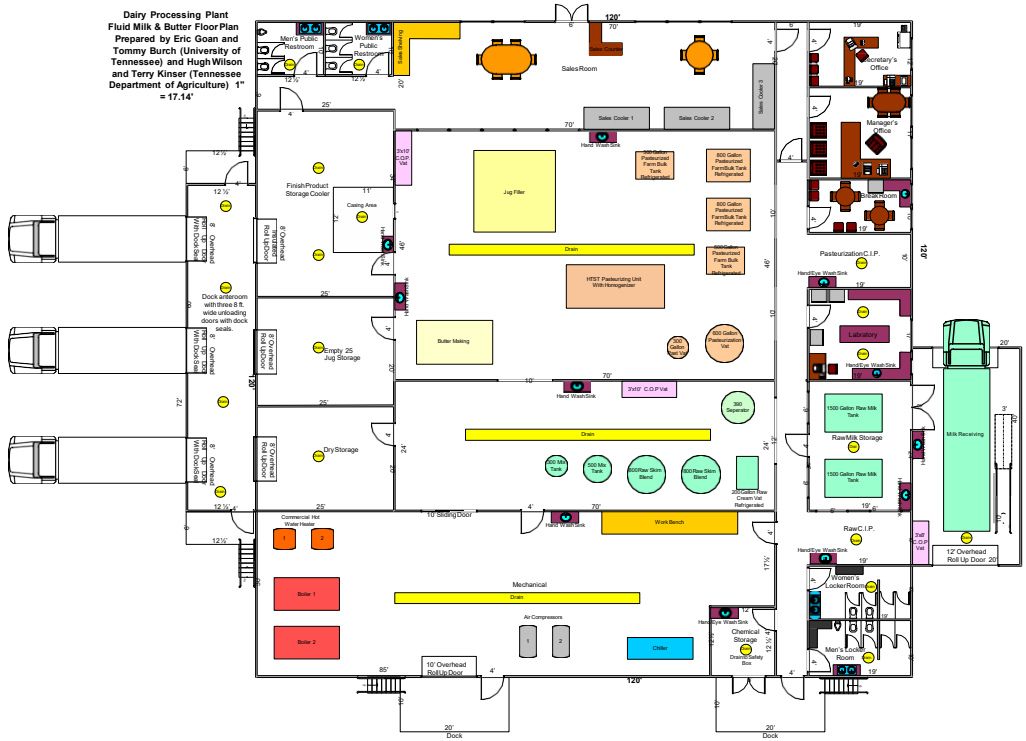
Getting Started

- Dairy Plant with HTST Pasteurization



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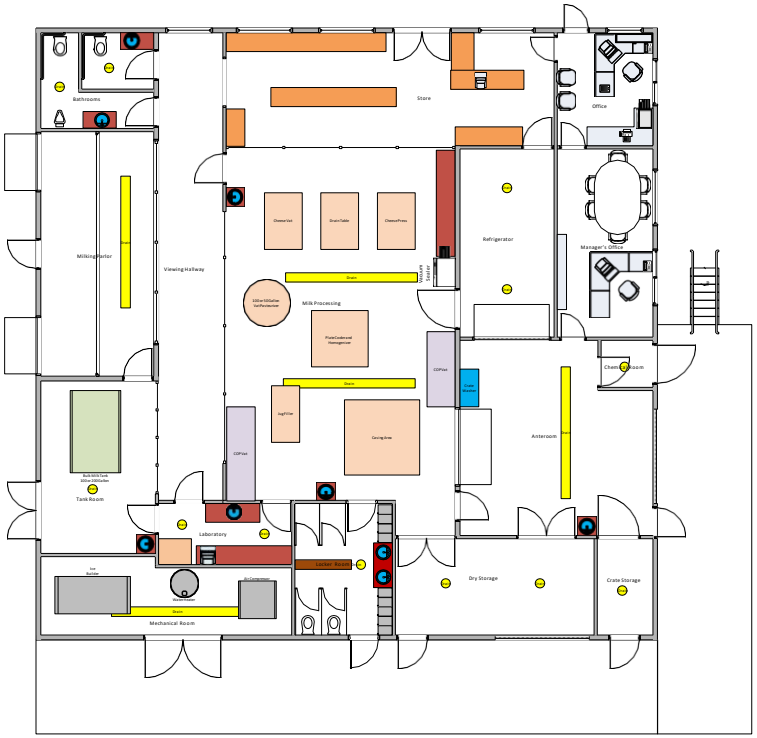
Getting Started

- Milking Parlor with Plant Attached



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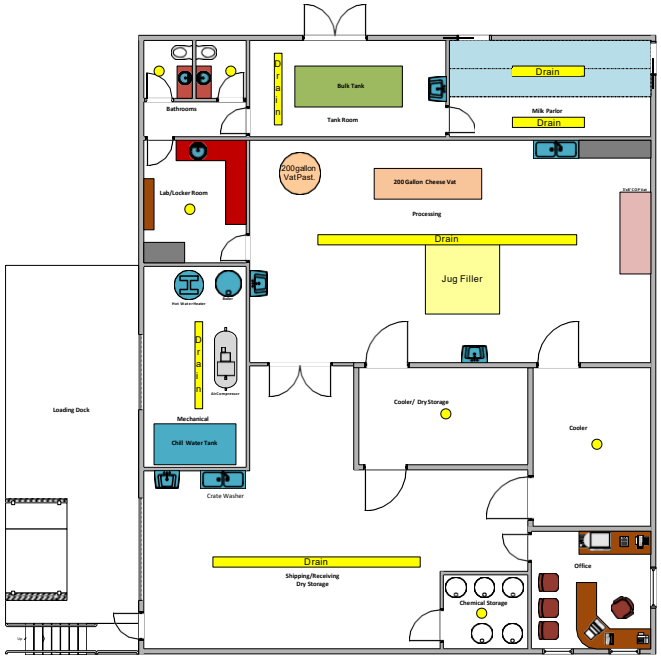
Getting Started

- Goat/Sheep Processing Facility



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Getting Started

- Regulations
  - Grade “A” Pasteurize Milk Ordinance (PMO)
    - All Federal Rules for producing and processing grade A milk
    - State rules vary state to state
  - Interstate Milk Shippers List (IMS)
    - Allows products to be sold across state lines
    - Three tiered inspection program on dairy plant and dairy farm for IMS
      - 1) Area inspector inspects plant every 3 months
      - 2) State rating officer conducts state survey every 2 years
      - 3) Federal rating officer conducts federal survey every 3 years
  - Food Safety Modernization Act (FSMA)
    - CFR Title 21 Part 117
    - Interstate Commerce
    - Food Safety Plan

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Production

- Personnel
  - Training!
- Process
  - Efficient but still produce a safe wholesome product
- Equipment
  - Mechanical
    - Adequate for operation and possible expansion
  - Production
    - Pass Inspection
    - Adequate for Operation
    - Made in a manner not to contaminate the Food Product.

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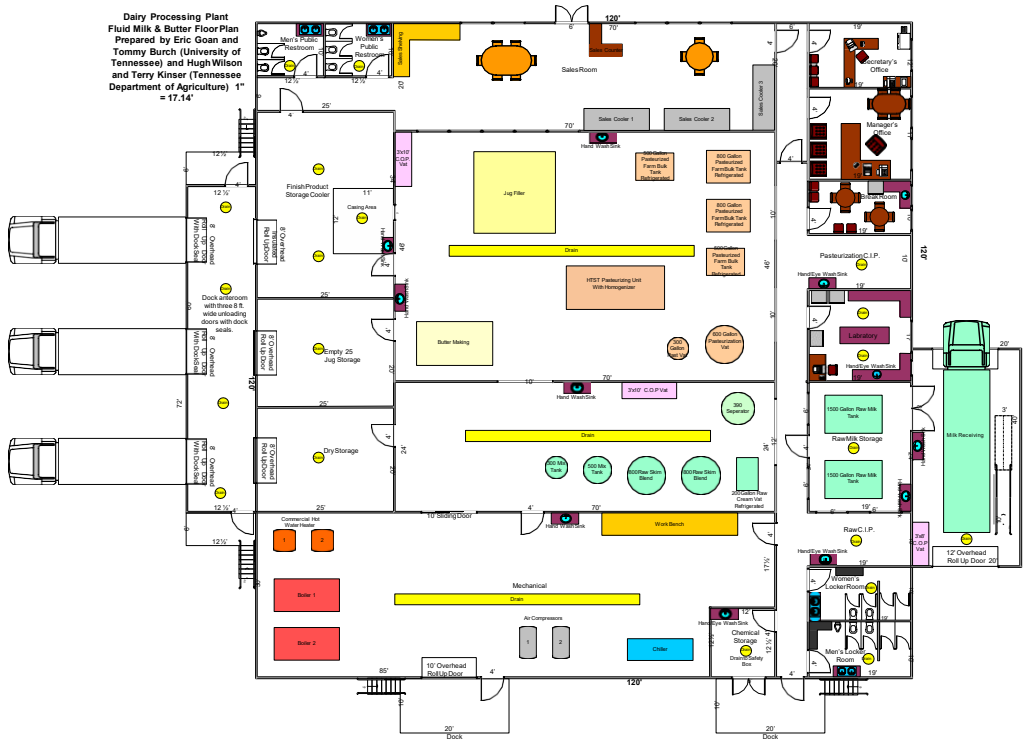
Production

- Equipment



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Pasteurization

- **PASTEURIZATION:** The terms "pasteurization", "pasteurized" and similar terms shall mean the process of heating every particle of milk or milk product, in properly designed and operated equipment, to one of the temperatures given in the following chart and held continuously at or above that temperature for at least the corresponding specified time:

Temperature	Time
145°F (63°C)	30 Minutes
161°F (72°C)	15 Seconds
191°F (89°C)	1.0 Second
194°F (90°C)	0.5 Seconds
201°F (94°C)	0.1 Seconds
204°F (96°C)	0.05 Seconds
212°F (100°C)	0.01 Seconds

- If the fat content of the milk product is ten percent (10%) or greater, or a total solids of 18% or greater, or if it contains added sweeteners, the specified temperature shall be increased by 3ºC (5ºF).

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Production

- Equipment
  - Pasteurizer
    - Vat or Batch Pasteurization
      - 145°F (63°C) for 30m
    - High Temperature Short Time (HTST)
      - 161°F (72°C) for 15s

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Production

- Equipment
  - Homogenizer
    - Breaks down fat globules
  - Jug Filler
    - Product must be mechanically filled and sealed
  - Fermentation Vat
    - Allows Yogurt to ferment

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Production

- Equipment
- Excess Cream
  - Butter
    - Utilizes more cream
    - Churn
  - Ice Cream
    - Limitations
      - Seasonal
      - Varieties
    - Uses less cream
    - Ice Cream Maker
    - Storage freezer

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Production

- Equipment
- Cheese Making
  - Make Sheet
  - Vat
  - Drain Table
    - Waste Material (Whey)
  - Press

http://www.wsu.edu/creamery/phototours/phototourschz.htm

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Quality Assurance/Regulatory

- FSMA, CFR Title 21 Part 117
  - Good Manufacturing Practices (GMPs)
  - Supporting programs
    - Standard Operating Procedures (SOPs)
    - Sanitation Standard Operating Procedures (SSOPs)
  - Hazard Analysis and Risk-Based Preventive Controls
  - Product Quality Testing

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Quality Assurance/Regulatory

- FSMA
  - GMPs
    - CFR Title 21 Part 117 Subpart B Current Good Manufacturing Practices
    - Usually refers to Practices and Procedures performed by a food processor which can affect the safety of the food product
    - Refers to the following: Personnel, Plant and Grounds, Sanitary Operations, Sanitary Facilities and controls, Equipment and Utensils, Process and Controls, Warehousing and Distribution, Holding and Distribution of human food by-products for use as animal food, and Defect Action Levels

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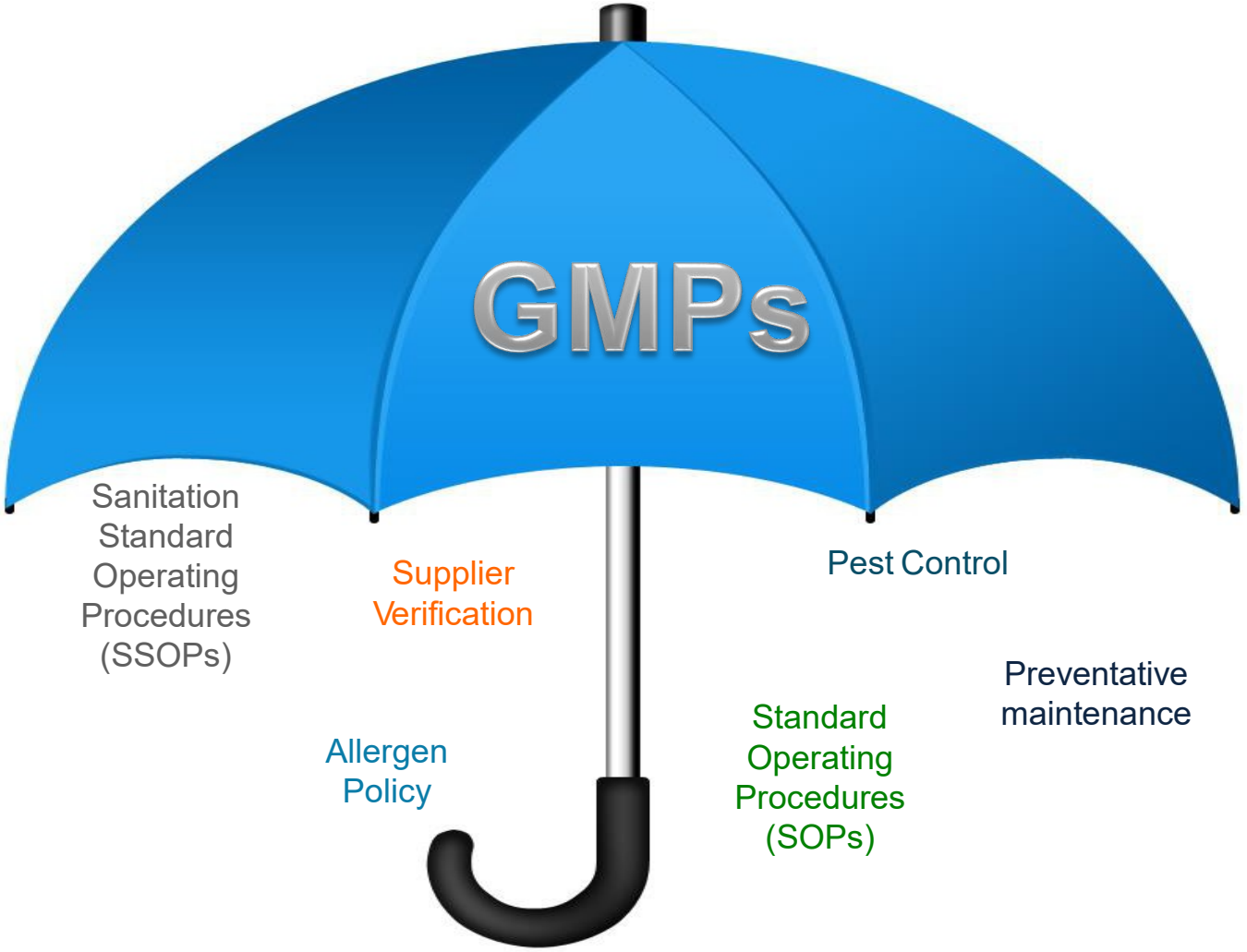

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Quality Assurance/Regulatory

- SOPs
  - Step by Step procedures on how to perform a task
    - Purpose
      - Standardize the process
      - Instructions that enables anyone within your operation to perform the task in a consistentmanner
    - Frequency
    - Who will perform the duty
    - Procedure
      - Detailed Steps
      - Corrective Actions
  - SOP document serves as an instructional resource that allows employees to act with out asking directions, reassurance, or guidance
- SSOPs
  - Standard Operating Procedures associated with Sanitation

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- Big Picture: A plant will develop GMP policies

- Up Close: Specific tasks will be detailed in Standard Operating Procedures (SOPs)

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Quality Assurance/Regulatory

- Hazard Analysis and Risk-Based Preventive Controls
  - Food Safety Plan
    - Hazard Analysis
      - HACCP Plan
    - Preventative Controls
    - Monitoring
    - Corrective Actions and Corrections
    - Verification and Validation
    - Recall Plan

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Quality Assurance/Regulatory

- Food Safety Plan
  - Must be prepared, or preparation overseen by one or more preventative controls qualified individuals
  - Must include the following:
    - Hazard Analysis
    - Preventative Controls
    - Supply-Chain Program
    - Recall Plan
    - Monitoring Procedures of the Preventative Controls
    - Corrective Actions
    - Records

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Quality Assurance/Regulatory

- Hazard Analysis
  - Identifies and Evaluates known or reasonably foreseeable hazards
  - Development of the HACCP Plan
    - Determining the critical control points with in your food process
- Preventative Controls
  - Taking the HACCP plan one step further
  - Determined the Critical Control Points
  - Preventative measure determined on how to control the product from reaching or being introduced to the hazard specified

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Quality Assurance/Regulatory

- Monitor
  - Observing the product's preventative control in place in intervals to ensure the control has been met and no food contamination
- Corrective Actions and Corrections
  - When the control fails and the product is either contaminated or not processed fully
    - Reevaluate the preventative controls and determine if there is a change needed

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Quality Assurance/Regulatory

- Verification and Validation
  - Verification: The application of methods, procedures, tests and other evaluations, in addition to monitoring, to determine whether a control measure or combination of control measures is or has been operating as intended and to establish the validity of the food safety plan
    - Are the controls in the plan actually being properly implemented in a way to control the hazard?
  - Validation: Obtaining and evaluating scientific and technical evidence that a control measure, combination of control measures, or the food safety plan as a whole, when properly implemented, is capable of effectively controlling the identified hazards.
    - Can the plan, when implemented, actually control the identified hazards?

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Quality Assurance/Regulatory

- Recall Plan
- Required to be written for any food with a hazard requiring a preventative control
- Describes the steps to take and assign responsibility
  - Notify direct customers and consignees
  - Notify the public, when appropriate
  - Conduct effectiveness checks
  - Execute disposition of food

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Quality Assurance/Regulatory

- Milk Tests Upon Receiving
  - Smell & Taste
  - Receiving Temperature
  - Titratable Acidity
  - Direct Microscopic Count (DMC)
  - Standard Plate Count
  - Somatic Cell Count
  - Drug Residue (Inhibitor Testing)
  - Lab Pasteurize Test
  - Freezing Point of Milk
  - Butterfat

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Quality Assurance/Regulatory

- Milk Defects
  - Absorbed
    - Feedy, barny, cowy, unclean, weedy, foreign
  - Bacterial
    - Acid, malty, unclean, putrid
  - Chemical
    - Cowy (ketosis), rancid, oxidized, sunlight, foreign

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Off Flavor	Possible Causes	Prevention
Oxidized (Cardboardy, mettalic)	Exposure to "white metal," worn tinned, or rusty surfaces on milk processing equipment	Use stainless steel, glass, plastic. Or rubber on all milk contact surfaces Pasteurize milk at higher temperature Homogenize milk
	Exposure to daylight or artificial light	Protect from artificial light and daylight; transfer promptly to milk cooler.
Rancid (Bitter, Soapy)	Warming cooled raw milk to 80F to 90F and recooling	Cool milk to 40F or lower when transferring to storage tank; avoid prolonged storage of raw milk. Separate milk cold or at 120F or above.
	Mixing raw milk with homogenized milk	Never permit any mixing of raw and homogenized milk unless pasteurized immediately thereafter.
	Excessive agitation or foaming of raw milk	Minimize pumping and never operate pumps in "starved" condition. Avoid air leaks in pipelines and equipment. Avoid splashing when filling tanks.
Feed or Weed (Unnaturally Sweet, Aromatic)	Eating or inhaling odors of strong flavored feeds (grass or corn silage, green forage, wild onion, or other weeds) shortly before milking	See "Producer Flavor Chart"
	Poorly ventilated barns	
Psychrophilic (Unclean, Fruity, Stale, Putrid)	Contamination of pasteurized milk	Check water supply regularly, and follow proper cleaning and sanitizing procedures for all processing equipment.
	Improper cooling	Cool pasteurized milk to 40F or lower maintain temperature until reaching consumer
	Prolonged storage	Identify product by code; practice proper rotation of products; hold samples at plant to check shelf life
Malty or High Acid (grapenut-like, sour)	Poorly cleaned equipment	Follow proper cleaning and sanitizing procedure for all processing equipment.
	Improper cooling	Cool raw milk when transferring to storage tank. Cool Pasteurized milk to 40F or lower and maintained temperature until reaching consumer.
	Prolonged storage	Identify product by code; practice proper rotation of products; hold samples at plant to check shelf life.
Other Off-Flavors Cooked (Eggy Flavor)	Excessive heat treatment	Avoid overheating; or avoid temperatures in excess of 150F in vat pasteurizers and 1.0F higher than specified in HTST Pasteurizers
Foreign	Contamination of milk with sanitizers	Proper use of Sanitizing agents
Flat	Low total solids in milk; improper draining of equipment	Thoroughly drain equipment prior to use

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Quality Assurance/Regulatory

- Finish Product Testing
  - Similar testing as to raw product
  - Recommend smell and taste
  - Shelf Life Testing
    - Recommend to hold longer than stated shelf life in harsher conditions
- Labeling
  - 21 CFR Part 101
    - Gives the specified location, size, font, etc.
  - Principal Display Panel
  - Information Panel
    - To the right of the Principal Display Panel
    - Nutritional, Ingredient Statement, Allergens
- Third Party Audits
  - SQF
  - AIB

BLUEGRASS Dairy and Food, Inc.

Thank You!

Any Questions?
Please feel free to contact at:
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Email: egoan@bluegrassdairy.com

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