

# Dairy Processing Plant and Equipment Considerations



Eric Goan

Dairy Processing Specialist

Department of Food Science Technology

University of Tennessee



# Processing Considerations

- 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?



# Processing Construction Requirements

## First Talk with Inspection Service (Tennessee Department of Agriculture) or UT Extension (Department of Food Science & Technology)

- Bill Thompson  
Food Manufacturing Administrator  
Tennessee Department of Agriculture  
440 Hogan Road  
Nashville, TN 37220  
Phone: (615) 837-5534  
Fax: (615) 837-5335  
Email: [bill.e.Thompson@TN.gov](mailto:bill.e.Thompson@TN.gov)
- Eric C. Goan  
Director Center for Food Processing  
Extension Specialist Dairy Processing  
The University of Tennessee  
Department of Food Science & Technology  
2510 River Drive  
Knoxville, TN 37996  
Phone: 865-974-7287  
Fax: 865-974-7332  
Email: [egoan1@utk.edu](mailto:egoan1@utk.edu)

# Processing Construction Requirements

- First Talk with Inspection Service (Tennessee Department of Agriculture) or UT Extension (Department of Food Science & Technology)
- Order of Approval Process
  - Site Approval (TDA)
  - Facility Approval (TDA)
    - Waste Water (TDEC)
    - Potable Water (TDEC)
    - Septic Tank (Health Department)
    - Direction of all facility Drains (TDA)
  - Equipment Approval (TDA)
    - Prior to Purchase and Installation
    - After Installation
  - Plant Layout and Design Approved (TDA)
  - Approved Lab (TDA)
  - Special License (TDA)
    - Plant Permit
    - Hauler/Sampler License
  - Chemical Approval (TDA)



# Processing Construction Requirements

- First Talk with Inspection Service Tennessee Department of Agriculture (TDA) or UT Extension, Department of Food Science & Technology (UTFST)
- Order of Approval Process
  - Site Approval (TDA)
  - Facility Approval (TDA)
    - Waste Water (TDEC)
    - Potable Water (TDEC)
    - Septic Tank (Health Department)
    - Direction of all facility Drains (TDA)
  - Equipment Approval (TDA)
    - Prior to Purchase and Installation
    - After Installation
  - Plant Layout and Design Approved (TDA)
  - Approved Lab (TDA)
  - Special License (TDA)
    - Plant Permit
    - Hauler/Sampler License
  - Chemical Approval (TDA)



# Processing Construction Requirements

- First Talk with Inspection Service (Tennessee Department of Agriculture) or UT Extension (Department of Food Science & Technology)
- Order of Approval Process
  - Site Approval (TDA)
  - Facility Approval (TDA)
    - Waste Water (TDEC)
    - Potable Water (TDEC)
    - Septic Tank (Health Department)
    - Direction of all facility Drains (TDA)
  - Equipment Approval (TDA)
    - Prior to Purchase and Installation
    - After Installation
  - Plant Layout and Design Approved (TDA)
  - Approved Lab (TDA)
  - Special License (TDA)
    - Plant Permit
    - Hauler/Sampler License
  - Chemical Approval (TDA)



# Processing Construction Requirements

- First Talk with Inspection Service (Tennessee Department of Agriculture) or UT Extension (Department of Food Science & Technology)
- Order of Approval Process
  - Site Approval (TDA)
  - Facility Approval (TDA)
    - Waste Water (TDEC)
    - Potable Water (TDEC)
    - Septic Tank (Health Department)
    - Direction of all facility Drains (TDA)
  - Equipment Approval (TDA)
    - Prior to Purchase and Installation
    - After Installation
  - Plant Layout and Design Approved (TDA)
  - Approved Lab (TDA)
  - Special License (TDA)
    - Plant Permit
    - Hauler/Sampler License
  - Chemical Approval (TDA)





# Processing Regulations

- Grade “A” Pasteurize Milk Ordinance (PMO)
  - All Federal and State of Tennessee 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
- Good Manufacturing Practices (GMPs)
  - Cornell online course
- Standard Operating Procedures (SOPs)
- Standard Sanitation Operating Procedures (SSOPs)
- Hazard Analysis Critical Control Points (HACCP)
  - Certification course offered through UTFST



# Processing Considerations

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

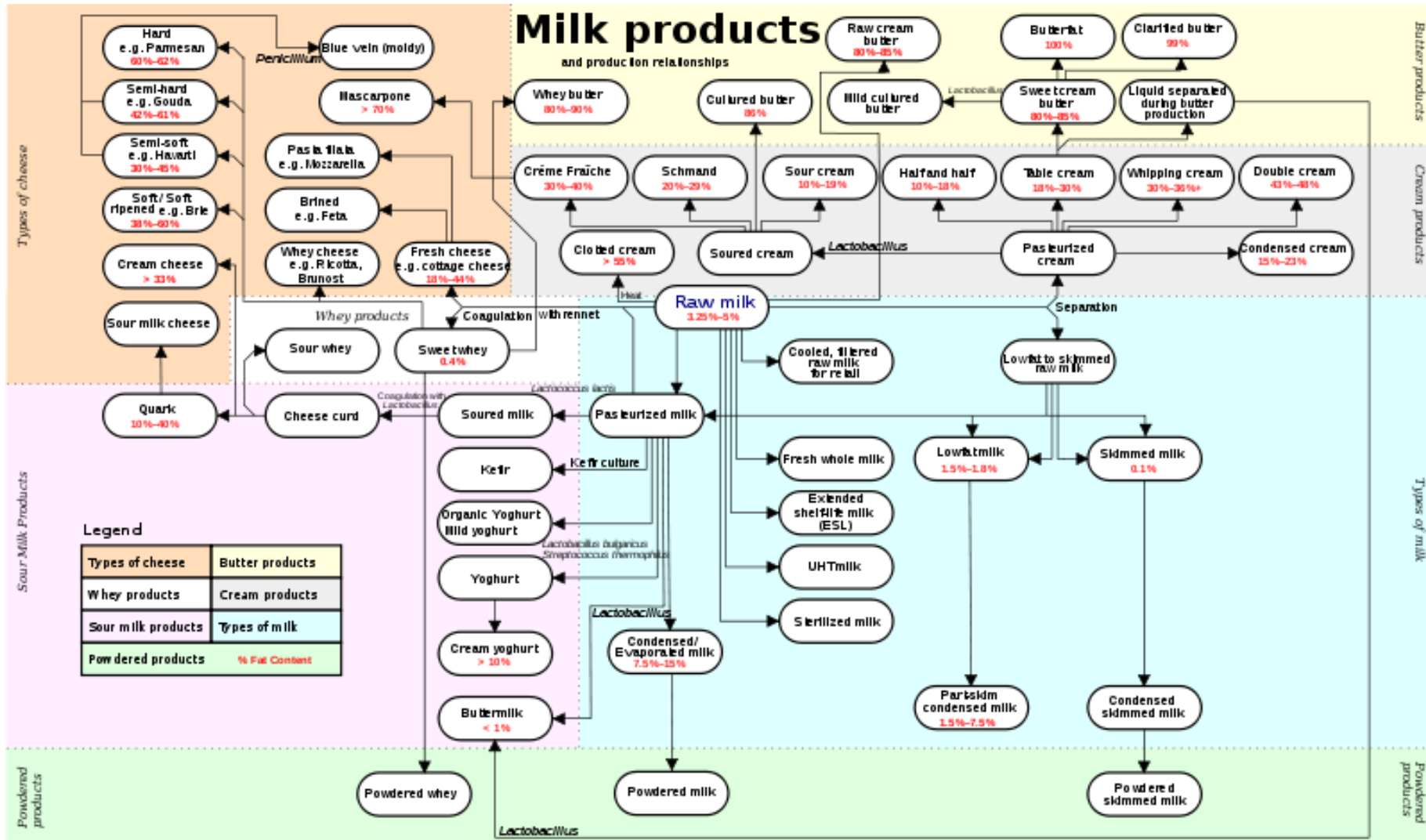


# Sources of Milk

**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

# Different Dairy Products



# Processing Plant

- Test Milk
- Separate Fat
- Mix Ingredients
- Pasteurize Milk
- Bottled or Further Processed (i.e. Cultured Products)



# Processing Plant

- Milk Tests

- 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



# Processing Equipment

- Milk Storage
  - Refrigerated Farm Bulk Tanks
    - Pasteurize Milk
    - Raw Milk
    - Cream Storage
- Separator
- Blend/Mix Tanks
- CIP and COP Systems



# Processing Equipment

- Pasteurization
  - High Temperature Short Time (HTST)
    - 161.5°F (72°C) for 15s
  - Vat or Batch Pasteurization
    - 145°F (63°C) for 30m



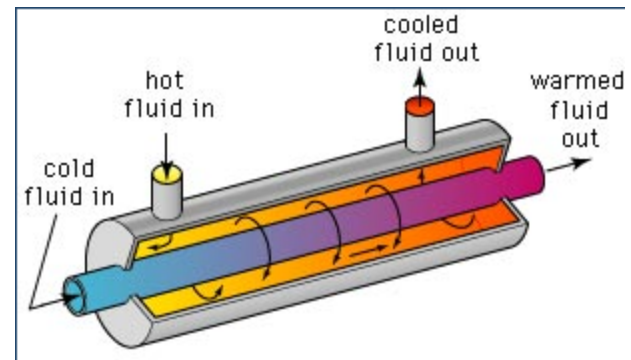
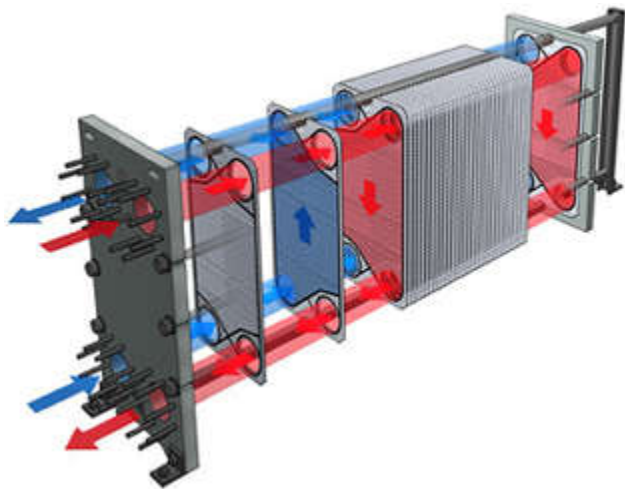
[www.dairyagentoday.com](http://www.dairyagentoday.com)



[www.shiercompany.com](http://www.shiercompany.com)

# Processing Equipment

- HSTS Pasteurizer Heat Exchangers
  - Plate Heat Exchanger
  - Tube in Tube Heat Exchanger





# Processing Equipment

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



# Processing Equipment

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



# Processing Equipment

- Cheese Making

- Make Sheet

- Vat

- Drain Table

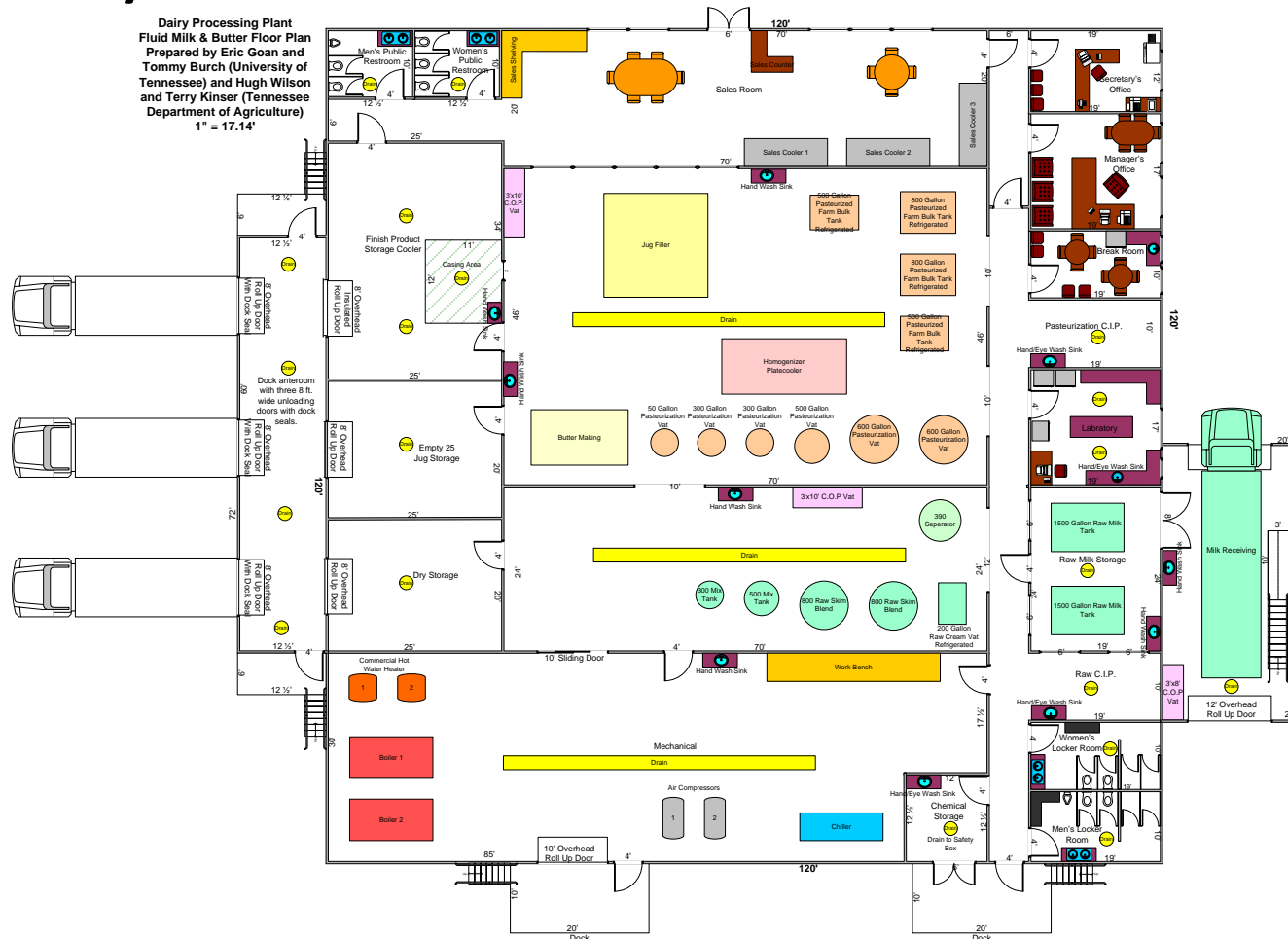
- Waste Material (Whey)

- Press



# Plant Considerations

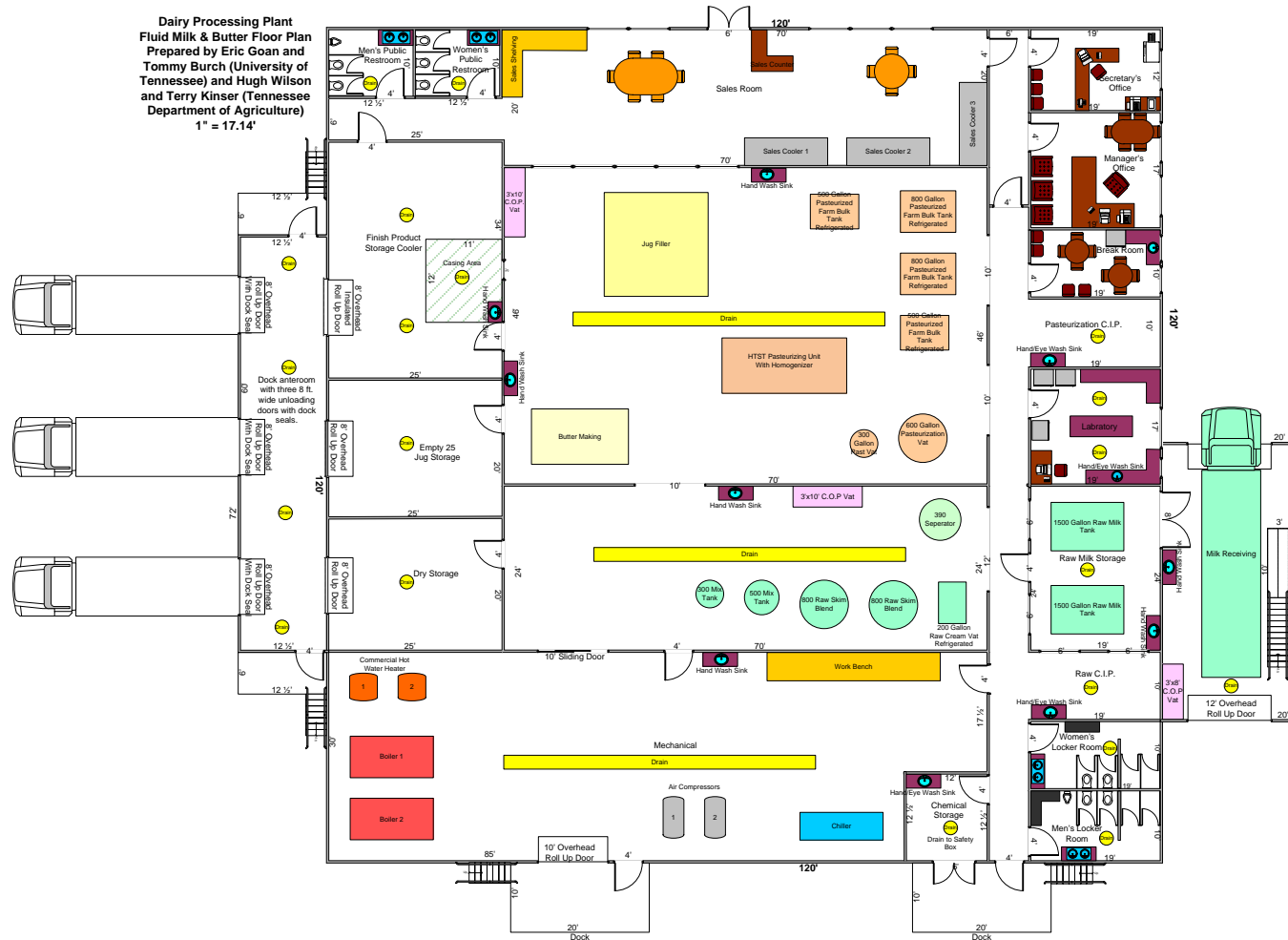
- Dairy Plant with Batch Pasteurization



# Plant Considerations

- Dairy Plant with HTST Pasteurization

Dairy Processing Plant  
Fluid Milk & Butter Floor Plan  
Prepared by Eric Goan and  
Tommy Burch (University of  
Tennessee) and Hugh Wilson  
and Terry Kinser (Tennessee  
Department of Agriculture)  
1" = 17.14'



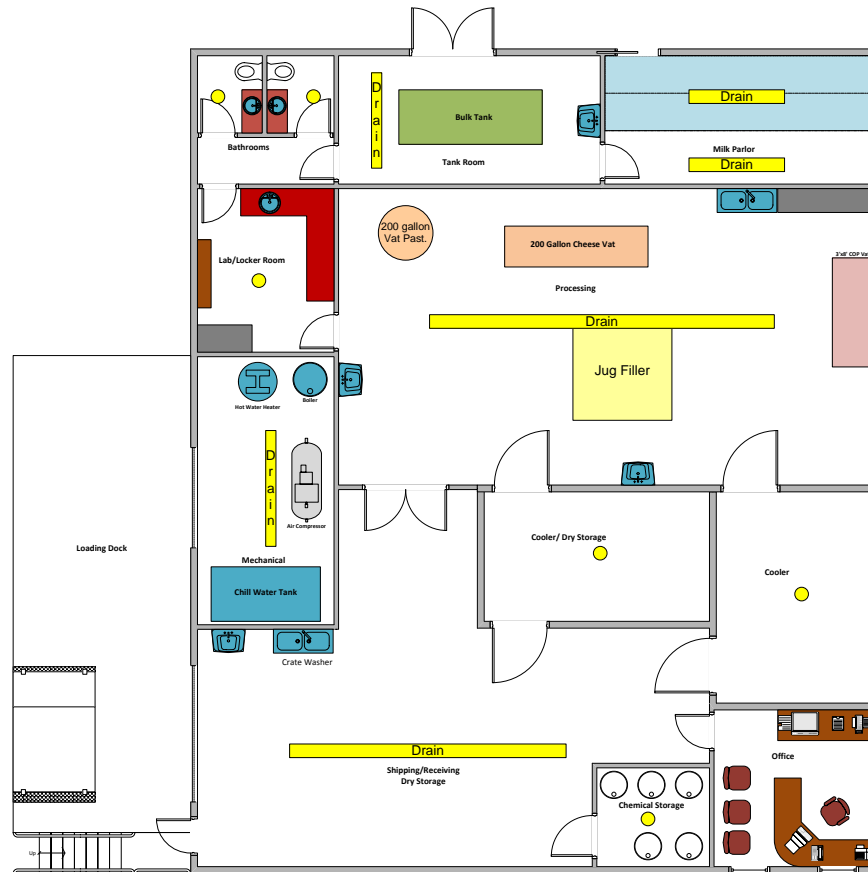
# Plant Considerations

- Milking Parlor with Plant Attached



# Plant Considerations

- Goat/Sheep Processing Facility



# Questions

