Dairy Processing
Plant and Equipment
Considerations

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

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• 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)
First Talk with Inspection Service Tennessee Department of Agriculture (TDA) or UT Extension, Department of Food Science & Technology (UTFST)

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• 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

<table>
<thead>
<tr>
<th>Species</th>
<th>Fat</th>
<th>Protein</th>
<th>Lactose</th>
<th>Ash</th>
<th>Total Solids</th>
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<tbody>
<tr>
<td>Cow</td>
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<td></td>
<td></td>
<td></td>
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<tr>
<td>Ayshire</td>
<td>4.1</td>
<td>3.6</td>
<td>4.7</td>
<td>0.7</td>
<td>13.1</td>
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<tr>
<td>Brown Swiss</td>
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<td>3.6</td>
<td>5.0</td>
<td>0.7</td>
<td>13.3</td>
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<tr>
<td>Guernsey</td>
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<td>3.8</td>
<td>4.9</td>
<td>0.7</td>
<td>14.4</td>
</tr>
<tr>
<td>Holstein</td>
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<td>3.1</td>
<td>4.9</td>
<td>0.7</td>
<td>12.2</td>
</tr>
<tr>
<td>Jersey</td>
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<td>3.9</td>
<td>4.9</td>
<td>0.7</td>
<td>15.0</td>
</tr>
<tr>
<td>Goat</td>
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<td>3.1</td>
<td>4.6</td>
<td>0.8</td>
<td>12.1</td>
</tr>
<tr>
<td>Sheep</td>
<td>5.3</td>
<td>5.5</td>
<td>4.6</td>
<td>0.9</td>
<td>16.3</td>
</tr>
</tbody>
</table>

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

DCQI Services http://www.dqci.com/milk-microbiology-analyses.html
• Milk Storage
  – Refrigerated Farm Bulk Tanks
    • Pasteurize Milk
    • Raw Milk
    • Cream Storage
• Separator
• Blend/Mix Tanks
• CIP and COP Systems
• Pasteurization
  – High Temperature Short Time (HTST)
    • 161.5°F (72°C) for 15s
  – Vat or Batch Pasteurization
    • 145°F (63°C) for 30m
Processing Equipment

- HSTS Pasteurizer Heat Exchangers
  - Plate Heat Exchanger
  - Tube in Tube Heat Exchanger
• Homogenizer
  – Breaks down fat globules

• Jug Filler
  – Product must be mechanically filled and sealed

• Fermentation Vat
  – Allows Yogurt to ferment
• 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

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

- Dairy Plant with Batch Pasteurization
• Dairy Plant with HTST Pasteurization
Plant Considerations

- Milking Parlor with Plant Attached
Plant Considerations

- Goat/Sheep Processing Facility