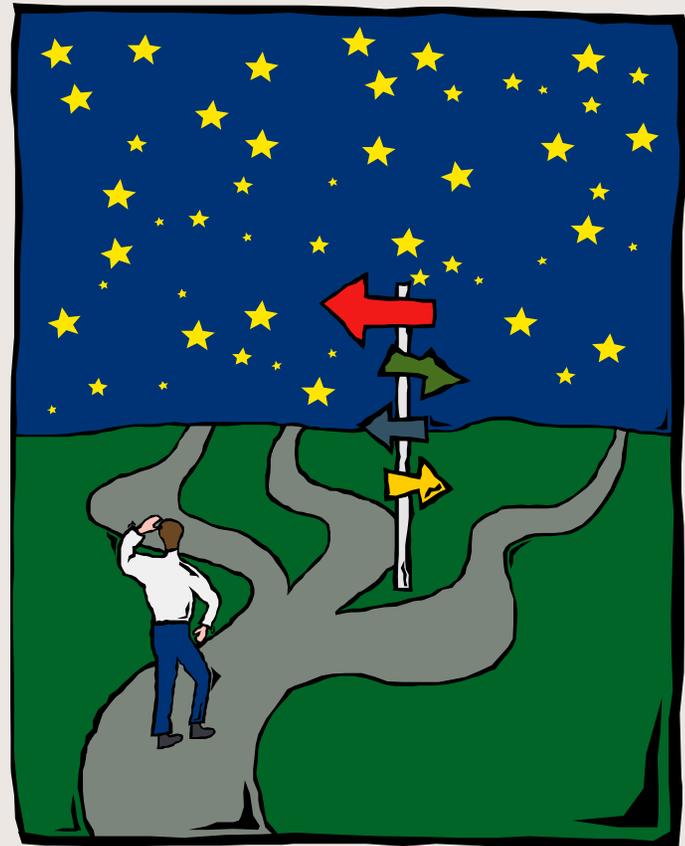
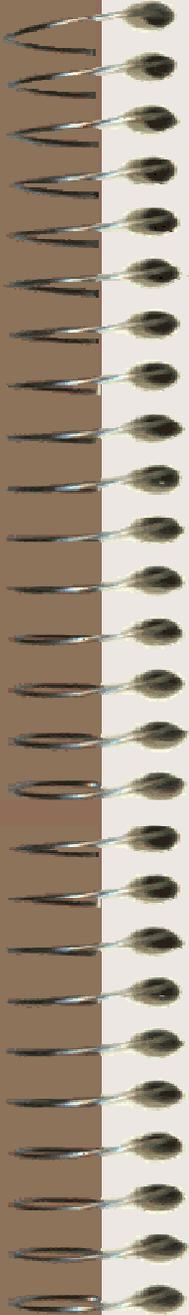
A spiral-bound notebook with a light beige, textured cover and a dark brown border. The metal spiral binding is on the left side. The text is centered on the cover.

# Equipping the Value Added Dairy Farm

# Getting Started

- Decisions





# Decisions... What do I want to make?

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## Fluid Milk?

- Pros

- Consumers use a lot of it & regularly.
- Tends to drive other sales.
- Can be inexpensive to process (raw, cream line, and “udder-run”)
- Often provides left over cream for other products.

- Cons

- Perishable product with limited shelf life.
- Can be expensive to process (pasteurized, homogenized, and standardized).
- It may be hard to differentiate yourself.



# Decisions... What do I want to make?

---

Butter?

- Pros

- There is a lot of demand for “homemade” butter.
- Butter is simple to make.
- Butter-making requires very little equipment.
- Nice companion product with fluid milk.

- Cons

- Packaging is time consuming – there is no simple automatic way.



# Decisions... What do I want to make?

---

Cream Products... whipping cream, sour cream, half & half, etc?

- Pros
  - They often accompany fluid products.
  - They help use up the “extra” cream.
- Cons
  - There is a limited market – small batches may be too inefficient to produce.
  - You may not have enough “extra” cream.

# Decisions... What do I want to make?

---

## Ice Cream?

- Pros

- Very popular product.
- Can be a very profitable product (hand-dipped).
- Long storage / shelf life – if kept very cold.
- Nice companion product with fluid milk.

- Cons

- Requires extra equipment expense.
- Takes a lot of cream – maybe more than you have available.
- It's got to stay frozen!

# Decisions... What do I want to make?

---

## Cheese?

- Pros

- There can be lots of demand... if you develop your market and you have a good product and...
- Long shelf life – can be a balancing product.
- May not require expensive equipment (raw milk cheese aged 60 days)

- Cons

- You need to be a cheese maker.
- “Everybody is doing it.”
- Doing it right will require some expensive equipment.



# Decisions... What do I want to make?

---

## Yogurt?

- Pros

- Simple to make.
- Can provide the highest sales dollars per lb of raw milk.
- There is demand for unique yogurt products.
- Drinkable yogurt works great as a companion to fluid products.

- Cons

- Cupped yogurt is very expensive to package – it's a Grade A product.
- You will never come close to the “big boys” in price.

# Decisions... Raw or Pasteurized?

- Raw
  - Growing demand from health-conscious consumers.
  - State by State regulations – do some careful research before beginning.
    - Stringent quality standards
  - Much simpler plant – no pasteurizer and little other equipment needed.
  - Fewer product options – basically no manufactured products.

# Decisions... Raw or Pasteurized?

---

- Pasteurized
  - Required in most states.
  - Required for manufactured products and non-fluid products.
  - Requires that expensive item called a “pasteurizer.”

# Decisions... Batch pasteurization or HTST?

- Batch
  - Choose this method if you are small – the equipment costs less and there is less waste with small batches.
    - Definitely if you will process less than 4500 Lbs (500 Gal) per day.
    - Works pretty well even up to 8000 Lbs (900 Gal) per day.
    - Can work for larger operations – get ready to pay the utility bill!
  - Choose this method if you want to market a niche product.
    - Low temperature pasteurization
  - The flavor will be different, although not offensive – let's dispel the myth!

# Decisions... Batch pasteurization or HTST?

- HTST
  - Choose this method if you are larger or plan to grow large soon – costs more to buy the equipment and watch out for wastage.
    - Pays for itself in energy savings at around 8500 lbs (1000 gal) per day.
      - Regeneration section heats up the cold milk while cooling down the hot milk.
    - Labor savings with larger batches.
      - Faster output in gallons per hour.
  - Taste should be more like customers expect.

# Decisions... “Udder Run” or Standardized?

- “Udder Run”
  - The milk contains full butterfat – at whatever percentage the cows are producing.
  - Generally goes with cream-line products
  - Greatly simplifies the plant – reduces up front costs.
  - You will lose all the potential profits from selling the cream, butter, or ice cream.
    - Americans purchase milk at approximately an average 1.8% butterfat – the rest of your cream is a free byproduct.

# Decisions... “Udder Run” or Standardized?

- Standardized
  - The cream level is “standardized”
    - Whole (3.25%)
    - Reduced Fat (2%)
    - Low Fat (1%)
    - Non Fat (<.5%)
  - Requires that piece of equipment called a “separator.”
  - Provides you with cream for other products.
  - The market for different levels of fat varies by consumer group.

# Decisions... Cream Line or Homogenized?

- Cream Line – not homogenized
  - Various health claims are attached to cream line milk, creating a niche market
    - Remember... a niche of a niche
    - Your sales will be significantly lower
  - Requires education of consumer – many people today have no idea what cream-line even means.
    - They will probably think that the thick stuff on top means the milk is spoiled.
  - Simplifies the plant and helps to reduce start-up costs.
  - Works better with glass bottles – cream tends to stick to the neck of a plastic jug.

# Decisions... Cream Line or Homogenized?

- Homogenized
  - Traditional milk – it's what consumers are used to.
  - Requires that piece of equipment called a “homogenizer.”
    - Milk is forced through a valve at extreme pressures and the fat molecules are broken up and dispersed through the milk.
  - Homogenization takes place at approximately 130 degrees... part of the HTST process or done before cooling from a batch pasteurizer.

# Decisions... Packaging - Glass or Plastic?

- Glass or Returnable Plastic
  - Growing consumer demand for environmentally friendly, returnable glass or plastic bottles.
  - Reduces your packaging costs dramatically.
    - Approx \$.12 - \$.15 savings per bottle
  - Allows you to charge more for your product.
    - Often \$.20 per half gallon + or –
  - You can make money on the bottle deposit.
  - Differentiates you from your competition.
  - Requires that piece of equipment called a “bottle washer” along with some extra operating costs.
  - Some stores don’t want the hassle of bottle returns – this limits your market.

# Decisions... Packaging - Glass or Plastic?

- Plastic
  - Traditional milk packaging.
  - More convenient for the consumer.
  - Widest market.
    - Pits you against all other processors.
  - Less labor required to run your plant.
  - Keeps your up-front costs lower and the plant simpler.
  - Higher packaging costs – much higher for you than your larger competitors.
    - They are probably blow-molding their plastic bottles in the plant.

# Decisions... How big should my plant be?

- Which end shall we start with – the cows or the consumer?
  - Cows... tells you the maximum capacity (perhaps)
    - They produce milk seven days a week. You will process ?? days a week.
    - Plan to sell some milk to the Coop in order to balance your production (unless you are going to make cheese).
  - Consumer... how big is your market?
    - At what level will you expect to start?
    - At what level do you plan to be in one year? in three years? in five years?
    - This is really the way to size your plant.

# Decisions... How big should my plant be?

---

- How long do you want to operate your plant each day?
  - Family labor
    - Get in and get done so that you can do other things.
    - Maybe the plant is oversized to gain speed.
  - Hired labor
    - Get the most out of your investment.
    - Keep the plant efficient.

# Decisions... How big should my plant be?

- HTST pasteurization
  - Smallest batch should equal 10 – 15 minutes of run time at a minimum.
  - Largest product run should not exceed 6 - 7 hours per day + cleanup.
- Batch pasteurization
  - Smallest batch should equal 1/3 of pasteurizer size
  - Largest product run should not exceed three batches per day.
- Cheese vat
  - Depending on culturing times – probably one batch per day per vat.

# Decisions... How big should my plant be?

- Growth plans
  - Purchase equipment sized to accommodate the growth of the next 1 – 3 years.
  - I wouldn't recommend sizing equipment for growth beyond 3 years.
    - Your product / market / goals may change
    - Upgrade at a later time – saves interest expense
  - You might want to consider sizing the building larger and/or designing the building for expansion.



# Decisions... How big should my building be?

---

- Plant layout is a subject all its own...
  - Remember the rooms that are easily forgotten.
    - Lab area / Office
    - Dry ingredient storage
    - Packaging storage
    - Staging area
    - Crate washing area
    - Large enough mechanical room



# Decisions... How big should my building be?

---

- Areas in the building where space requirements mushroom...
  - Packaging Storage
  - General Storage
  - Cooler
  - Aging Room

Maybe you should plan your building to be able to expand these areas.



# Decisions... How will I balance production with processing?

---

- Selling milk to the coop?
- Buying milk in when needed?
- Making a long shelf-life product
  - Ice Cream
  - Cheese
- Separating the milk and feeding the skim milk to the hogs?

# Decisions... What energy source should I use?

- Options – think outside the box
  - Electric
    - \$2.93 Per 100,000 BTU's (\$.10 per kWh)
  - Fuel
    - \$1.69 per 100,000 BTU's (\$2.35 per gal)
  - LP Gas / Natural Gas
    - \$1.78 Per 100,000 BTU's (\$2.70 per gal)
  - Coal
    - \$.85 Per 100,000 BTU's (\$209.00 per ton)
  - Wood
    - ??

# Decisions... Steam or Hot Water Boiler?

---

- Steam Boiler
  - It's quick to get up to temperature
  - It provides steam for air space requirements
  - It's expensive to install
    - The boiler is expensive
    - The piping is expensive
  - It's inefficient to operate
    - 85% efficiency at best

# Decisions... Steam or Hot Water Boiler?

- Hot Water “Boiler”
  - It is less expensive to install
    - Boilers are smaller and less expensive
    - Piping is simpler and less expensive
  - It is more efficient to operate
    - 92% - 96%
  - It can be slower – depending on system design
  - Separate steam generator needed for air space



# Decisions... New or Used Equipment?

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- New
  - Some things you just can't find used any more.
    - Cheese vats
    - Small batch pasteurizers
  - Some new items are much more efficient.
    - HTST systems
  - Some used equipment doesn't pass current regulatory requirements
    - Ask before you buy

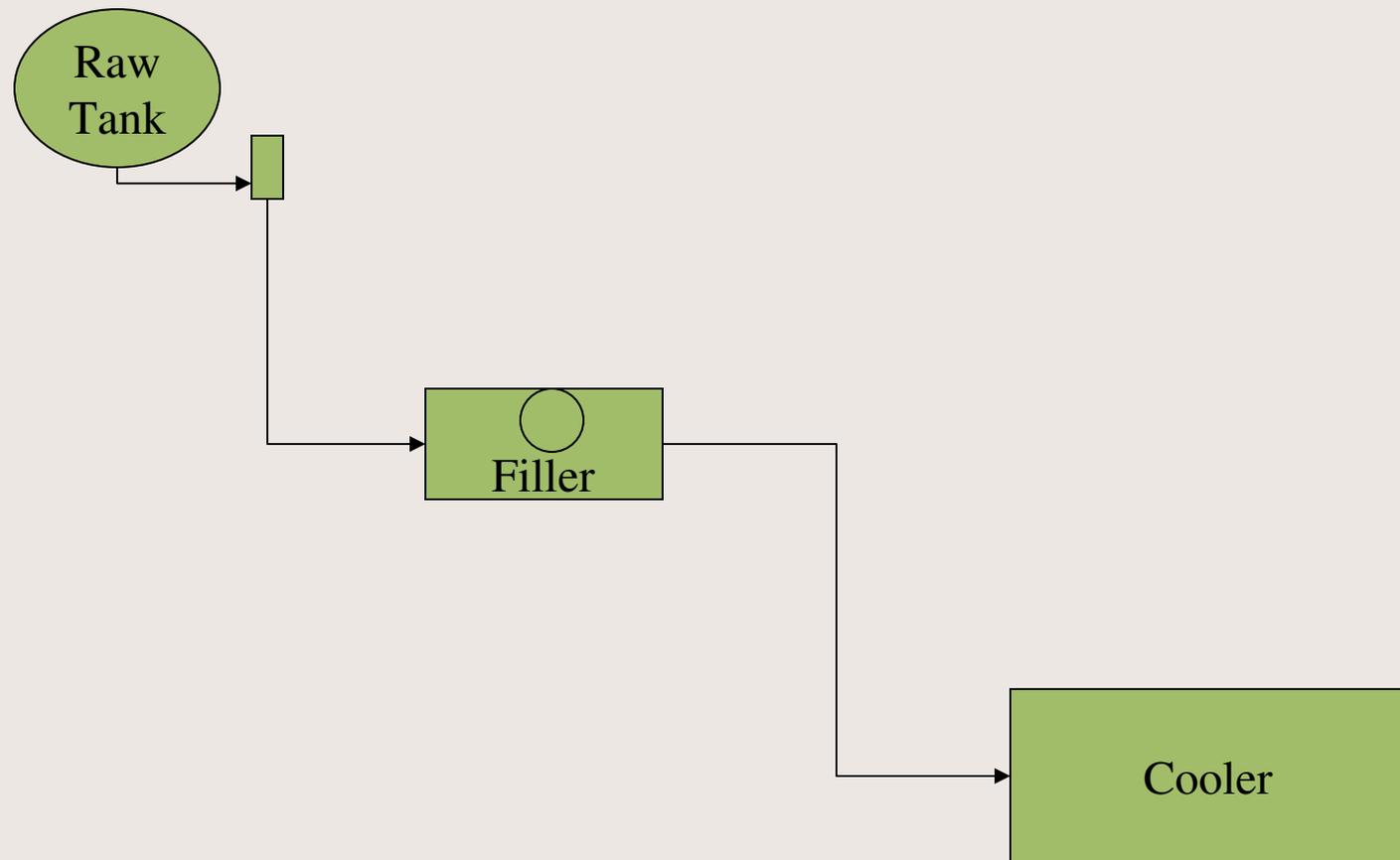


# Decisions... New or Used Equipment?

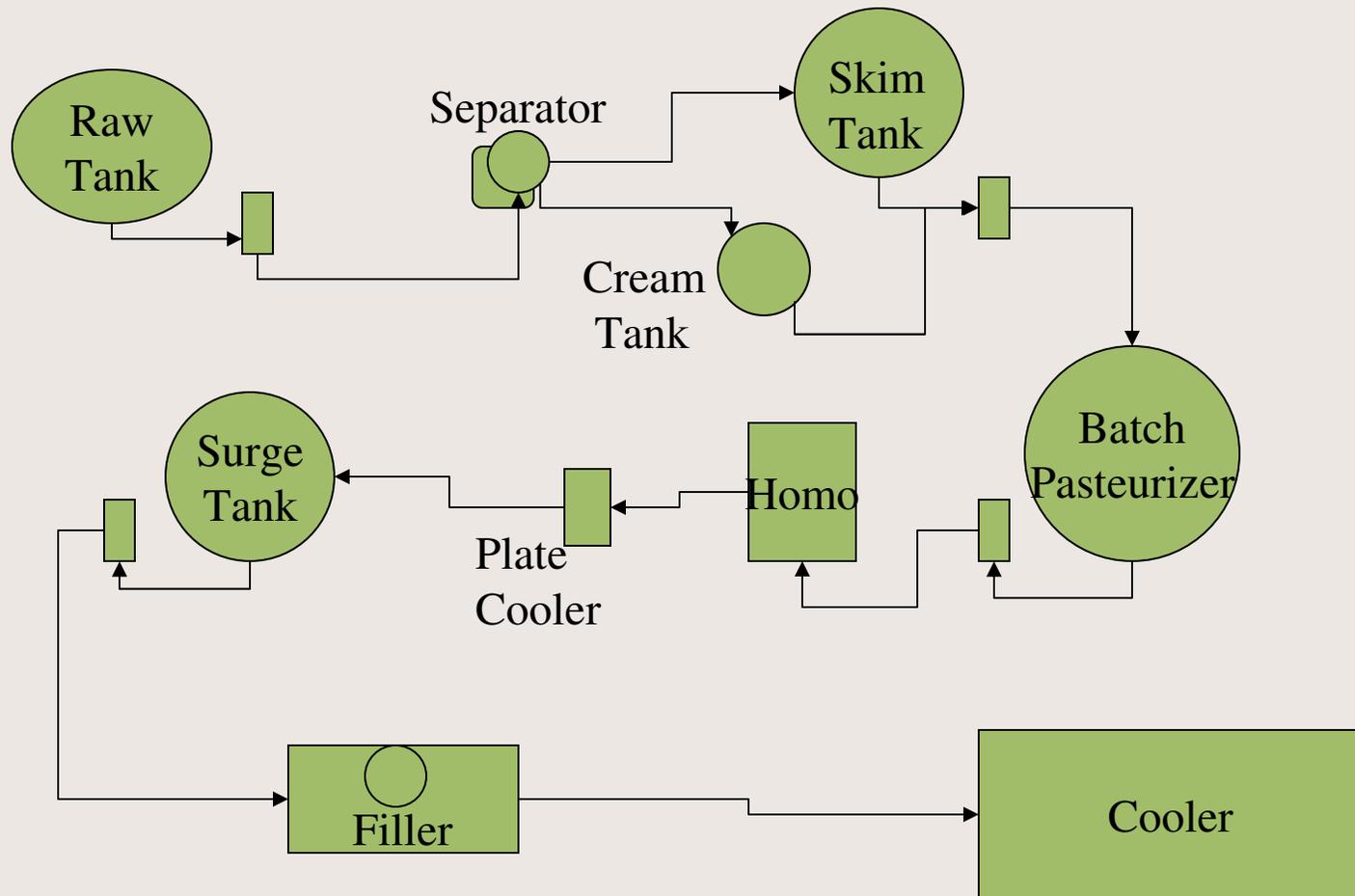
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- Used
  - Often is a great option.
    - Lowers up front costs
    - They just don't build things like they used to
  - Make sure you know what you are getting
    - Demand has exploded and many buyers lack experience – some sellers don't have the integrity that they should have.
  - Decide what level of involvement that you want to have in the process...
    - Of the hunt
    - Of the purchase
    - Of the rebuild

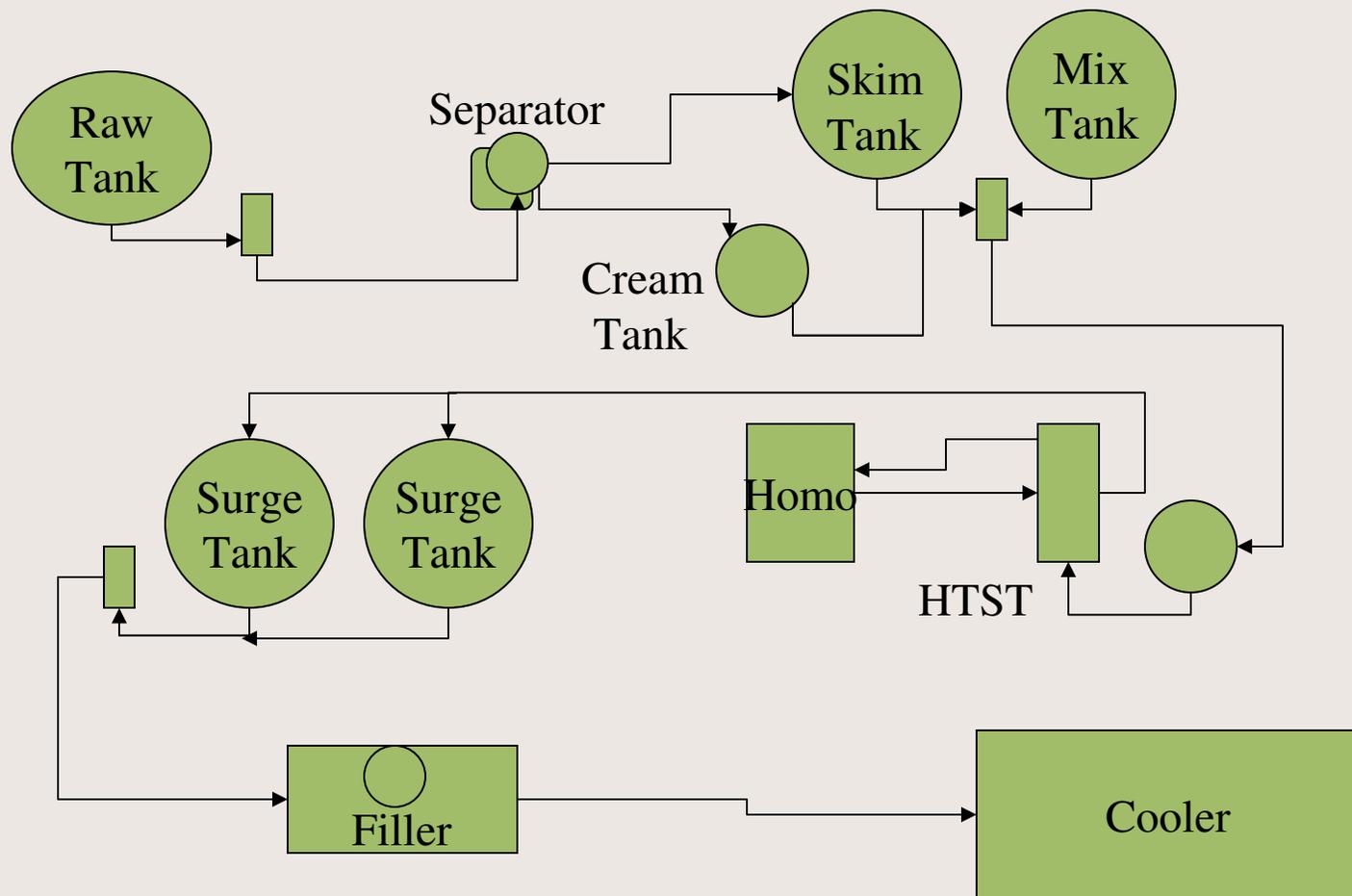
# Example Plant Flowchart – Raw Milk



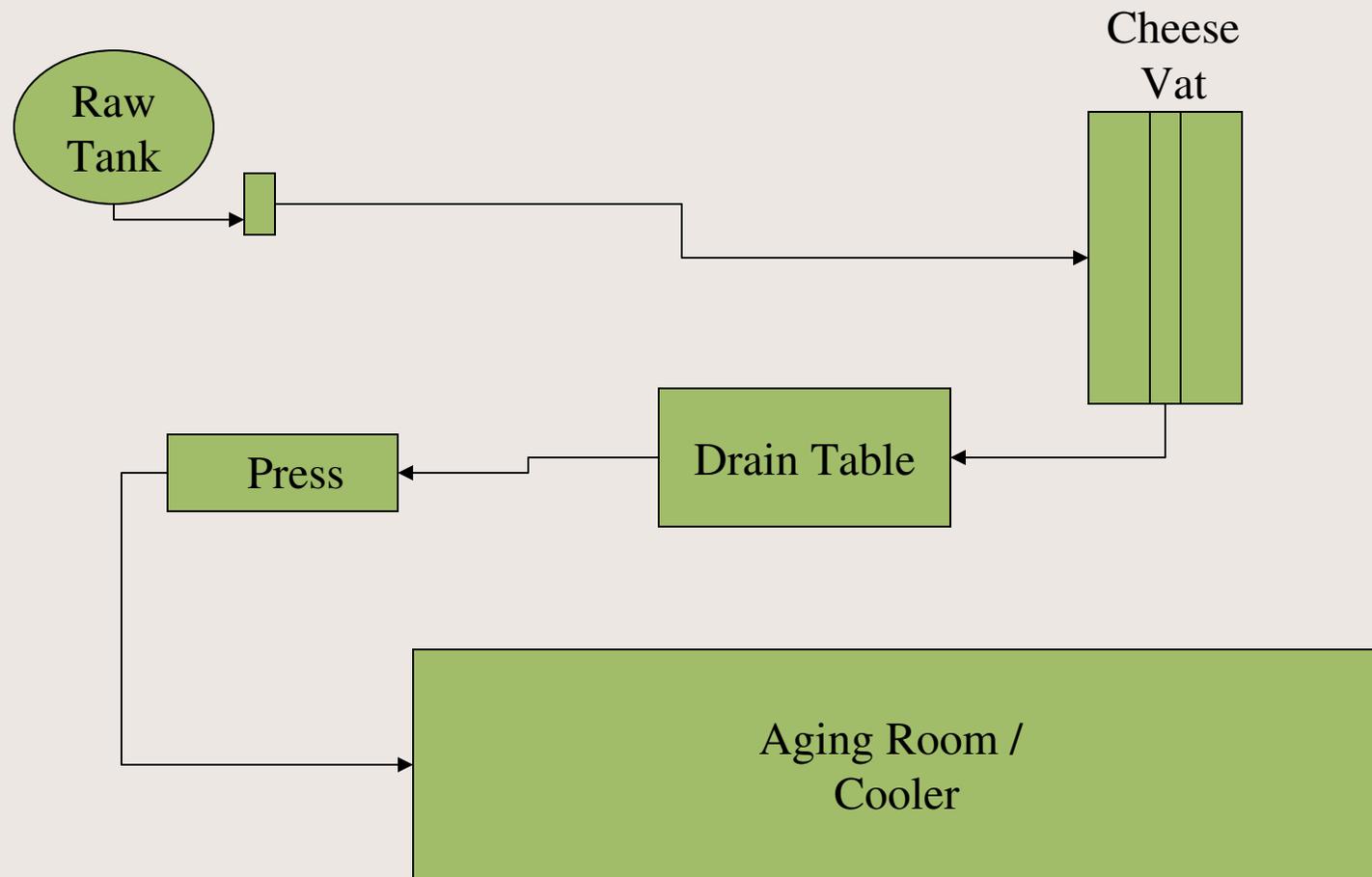
# Example Plant Flowchart – Pasteurized Milk (Batch)



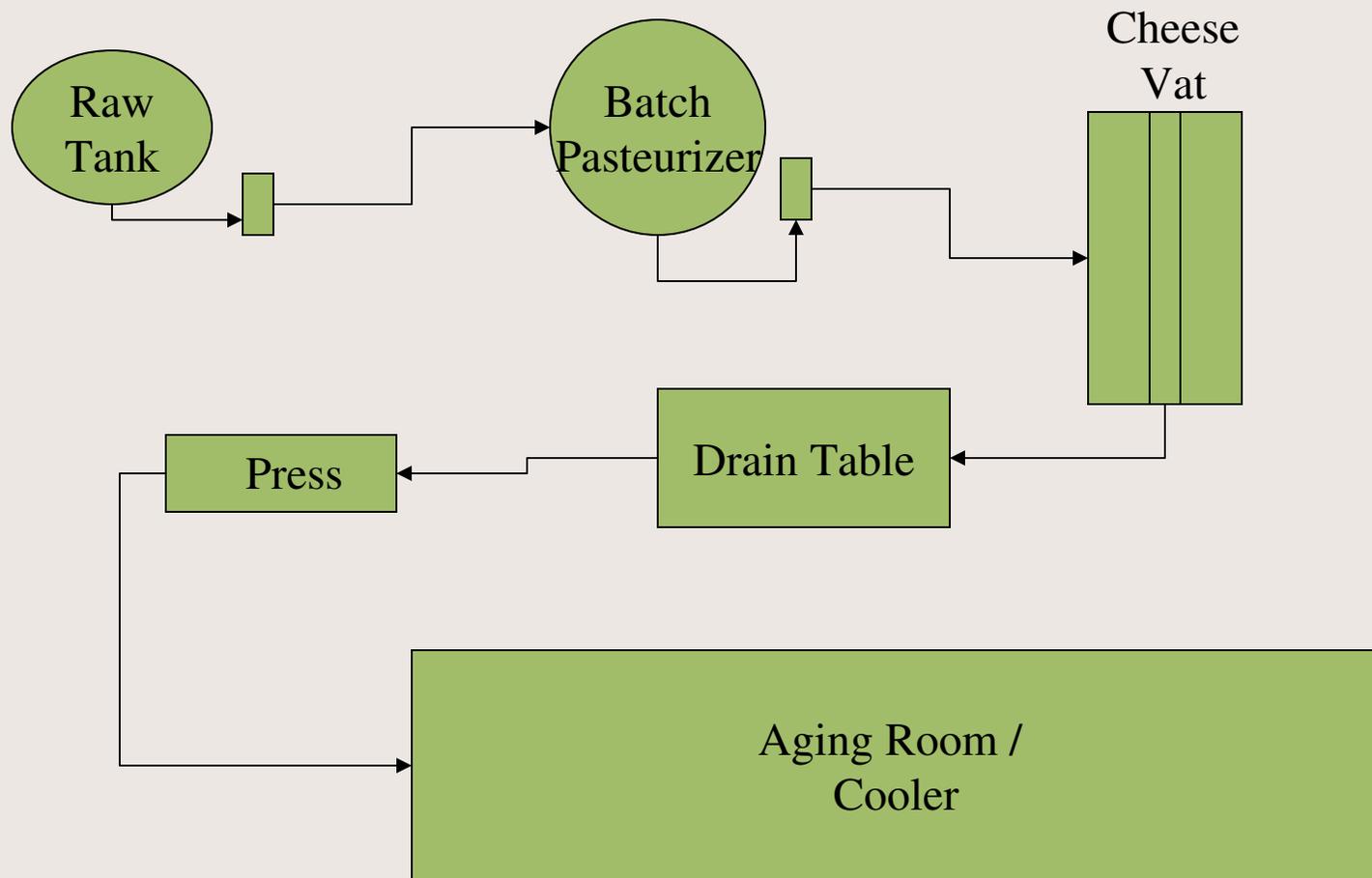
# Example Plant Flowchart – Pasteurized Milk (HTST)

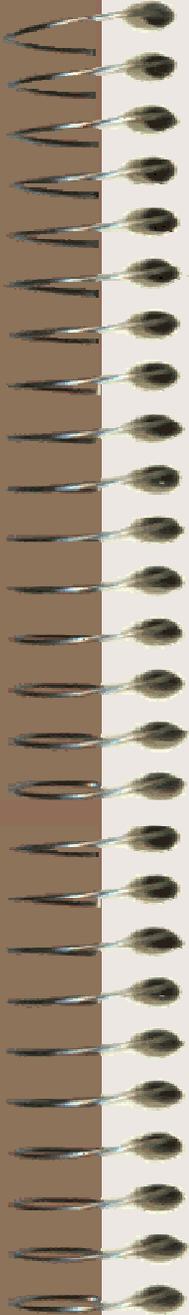


# Example Plant Flowchart – Raw Milk Cheese



# Example Plant Flowchart – Pasteurized Milk Cheese





# Selecting equipment -Tanks

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- Round verticals are in high demand and are more expensive.
- Use a old farm tank if you can.
- Can you use one that is a “leaker?”
- Avoid an “over purchase”
  - Buy a batch pasteurizer for a storage tank.
  - Buy an insulated tank when a single shell will do.
  - Buy a tank “good for milk” if all you need is an insulated storage tank.

# Selecting equipment -Tanks

- Always inspect for condition
  - Look for the obvious internal damage – dents, scratches, chemical burns
  - Agitator drive – gearbox leaking? good running condition?
  - Is it “good for milk?”
    - Insist on pressure testing
  - Compressor condition (if needed)
  - Tank Washer
- CIP is not all that hard – save yourself some elbow grease and time
  - Sprayballs can be installed on older tanks



# Selecting equipment - Pumps

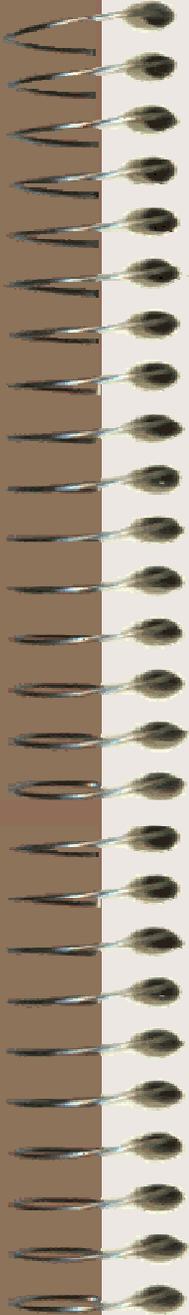
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- Small pumps are in high demand
- New ones aren't that expensive – don't pay a lot of money for a pile of junk
- Inspect for condition
  - Motor – does it run?
  - General appearance
  - Seal plates cost money
- Is it a popular brand?
  - Triclover or Ampco
  - Fristam
  - A farm milk pump (DeLaval, Boumatic, Westfalia-Surge)



# Selecting equipment – Batch Pasteurizers

- Research carefully or deal with a reputable dealer.
- What are you getting for what you are paying?
  - Just the shell?
  - Is it atmospheric or pressure wall?
  - With good agitator? (sweep?)
  - Leak detect valve? (in good condition?)
  - Thermometers? (indicating & air space)
    - Mercury ones are no longer available new
  - Recording thermometer? (wind-up or electronic?)



# Selecting equipment – Batch Pasteurizers

- Atmospheric – water must flow through without generating any pressure
  - Spray ring / Water bath
  - Could require a braze plate heat exchanger and/or an extra pump.
  - Older and less efficient
- Pressure wall – water can be pushed through under pressure and returned to heat or cooling source
  - Newer & more efficient



# Selecting equipment – HTST Pasteurizers

- There are a lot of components to an HTST system – what's included in what you are buying.
  - Balance Tank
  - Pump(s)
  - Plate pack
  - Recorder-Controller with all the sensors
  - Holding Tube
  - Flow Diversion valve (and leak detect valve)
  - Flow Diversion panel (or old-style Taylor controls)
  - Sight glass, vacuum breaker, test ports, pressure differential control, etc.



# Selecting equipment – HTST Pasteurizers

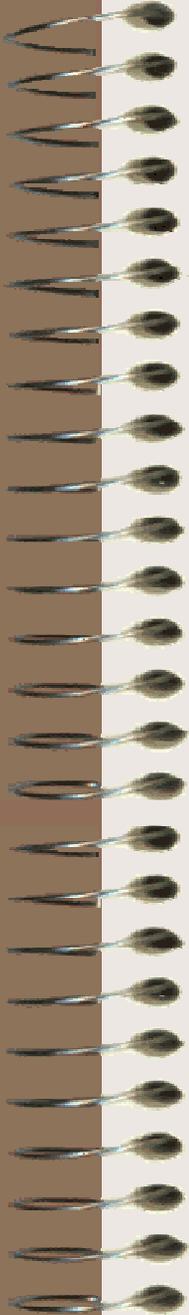
- There are old & nearly worthless systems out there for sale.
  - Leaking or low pressure plate packs with old Taylor controls, cracked balance tanks, and bevel seat joints in the holding tube.
- There are very few newer style used systems available.
  - Newer higher pressure plate packs with electronic controls
- There are a few older systems that still have some life in them.
  - Plate packs in good condition that can be upgraded to new style controls – now or later.

# Selecting equipment – HTST Pasteurizers

- Key areas to watch out for...
  - Plate Pack
    - Brand?
    - Pressure capability?
    - Has it been sitting? Plan to have it inspected and regasketed unless in use and/or recently rebuilt.
    - Size? Too large? Too small?
    - Efficiency of regeneration section?
      - Older units are often around 80% or even less
      - Newer units can be 90% or higher

# Selecting equipment – HTST Pasteurizers

- Key areas to watch out for...
  - Control / Flow Diversion Valve
    - Taylor single stem controls – all mechanical / no leak detect valve
      - Still allowed in some states
      - Obsolete and will become a problem to repair soon
    - Alfa-Laval (or other brand) flow diversion panel with separate flow diversion & leak detect valves. Anderson AV9900 recorder-controller
      - The current model



# Selecting equipment – Cream Separators

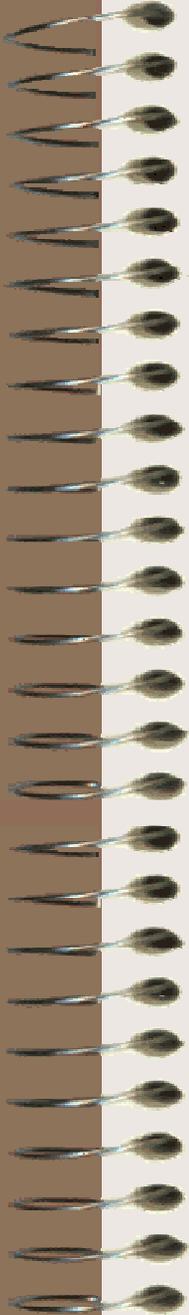
- Cold milk or Warm milk?
  - Cold milk
    - Mostly DeLaval brand out there – they are excellent units even though they are old
    - Milk is pumped through – not gravity fed
    - Size can be an issue
      - 240, 242, 340, 342 (approximately 200 gal/hr)
      - 270, 272, 370, 372 (approximately 450 gal/hr)
      - 290, 292, 390, 392 (approximately 640 gal/hr)
    - We have not found a source for new cold milk separators in the small sizes.



# Selecting equipment – Cream Separators

---

- Cold milk or Warm milk?
  - Warm milk
    - Some real old used models out there – some of them still work.
    - Most units are gravity fed – output will be gravity as well
    - New units are available
    - Available in smaller sizes – wide range of sizes available.



# Selecting equipment – Cream Separators

---

- Some things to watch out for...
  - Does the separator work?
  - Does the separator run with minimal vibration?
    - Rebalancing is expensive
  - Do a visual inspection. Has the separator been well cared for or is it all beat up?
    - The separator gets torn apart and put together every processing day. Some of them could tell a lot of stories if they could talk.
  - Is it painted frame or stainless frame?
    - If painted, make sure disc stack will pass inspection
    - Watch out for soldering in milk contact areas

# Selecting equipment – Homogenizers

- Brand makes a difference here.
  - Gaulin is by far the most popular
  - Cherry Burrell, Creamery Package / Crepaco, etc. are out there (make sure you know what you are getting)
- These machines are often very old but can still work fine.
  - Get the model and serial number. Age influences price.



# Selecting equipment – Homogenizers

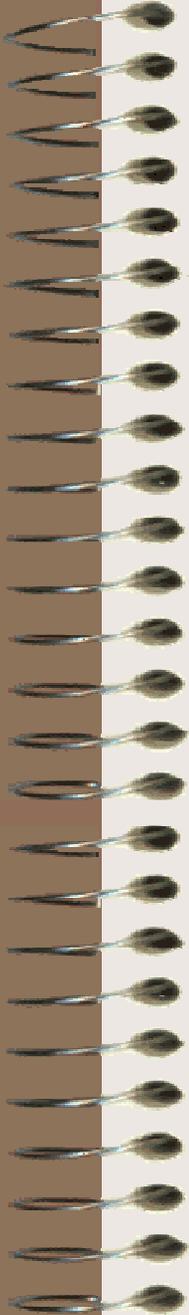
- Most machines are painted frame – stainless shielded machines are newer and much more costly
- These machines are similar to an engine – crankshaft, connecting rods, pistons, and valves
  - Does it need an overhaul?
- Know the size that you need. Find out the range of the machine you are looking at.
- Plan to buy used – they are still fairly available and new ones are **EXPENSIVE**.



# Selecting equipment – Bottle Fillers

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- How fast do you need to go?
- Watch out for cap design!!!!
  - More than one cap can be a problem
- Will you need to convert for glass to plastic or vice versa?
- Grade A milk must be mechanically capped.
  - Watch out for the little non-stainless fillers.
- New small fillers available.
  - Less expensive than used automatic machines
  - Allows you to handle small batches with less waste and down time.



# Selecting equipment – Bottle Fillers

- Automatic machines
  - Brand makes a difference here as well
    - Federal is by far the most popular
    - Cherry Burrell, Cemac, Fogg, and others out there too.
    - Watch out for converted Federals with a Filler Specialties tag!!! They are orphans.
  - Cappers are tricky – will it handle your caps?
    - New cappers and chutes are expensive.
  - Will you need other star wheels to fit your containers?
  - Fillers are sold different ways – what are you getting?
    - Just a filler?
    - A filler with a caps feeder and caps chute?
    - A filler with caps feeder, chute and input & output conveyor?



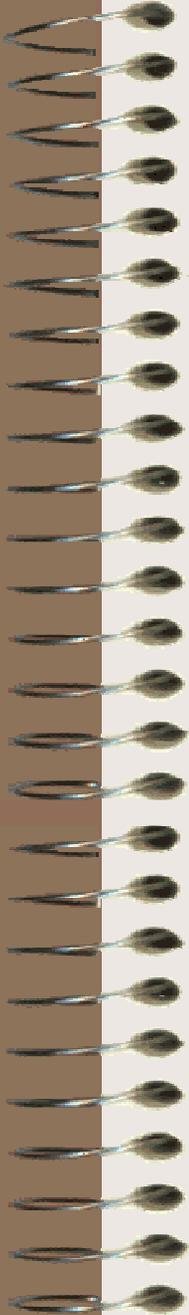
# Selecting equipment – Bottle Washers

- Batch or Continuous Flow?
  - Batch washers are basically only available new at this point.
    - Less expensive than used continuous flow machines.
    - Works well in small plants.
    - Washes up to 200 bottles per hour.
  - Continuous flow washers are basically only available used (unless you own the bank).
    - Needed for larger plants
    - Washes 960 – 2800 bottles per hour.



# Selecting equipment – Bottle Washers

- Purchasing a used continuous flow washer...
  - Looks are deceitful!!!
    - Many of them are in worse condition than they appear.
    - Others are in better condition than they appear.
  - Almost all of them need serious work before being reinstalled.
    - Tanks rusted out
    - Chain badly worn
    - Linkage worn and loose
  - What is a rebuilt bottle washer?
    - Completely torn down, sand-blasted, powder-coated, and assembled with new plumbing and electrical components.



# Selecting equipment – Butter Churns

- Generally new machines available.
  - If air, you need a lot of it – both pressure & volume
  - If electric, you need variable speed.
- Two common styles
  - Rotating drum
  - Stationary drum with rotating paddles
- Common sizes for small plants
  - 10 gal (some even smaller)
  - 25 gal
  - 40 gal
- Do you really need a churn?
  - What about using an ice cream freezer? Hobart mixer?

# Selecting equipment – Ice Cream Freezers

- Batch or Continuous
  - Batch freezers typical for small dairies.
    - Emory Thompson are the most popular batch freezer.
      - 10, 20, and 40 quart models
      - Self contained or remote compressor
      - Capacities up to 50 gal/hr
      - Is it an all stainless machine?
    - Continuous freezers start at around 50 gal/hr on the small side and get much bigger.
      - More waste for small batches
      - Much more expensive.



# Selecting equipment – Cheese Vats & Accessories

---

- Where do we want to go today?
  - Just about any tank can be made into a cheese vat
    - You can make cheese in a plastic tub from Wal-Mart.
    - You can make cheese in an old milk tank.
  - Know the cheese you want to make and how to make it before you start looking.
  - Small used cheese vats are almost unavailable.



# Selecting equipment – Cheese Vats & Accessories

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- What do you need your cheese vat to do?
  - Heat the milk to culturing temperature?
  - Maintain temperature over time?
  - Cook the curd?
  - Agitate? Removable agitator?
    - Is a strong man needed to remove the agitator?
  - Make it easy for uniform curd cutting?
  - Allow for draining and pumping of curd?
  - Press under the whey?



# Selecting equipment – Cheese Vats & Accessories

---

- Did you want it to be energy efficient?
  - Pressure wall vats allow for recirculation of hot water.
  - Water bath / Atmospheric vats either run water to drain or require an additional pump.
- Did you want to get done anytime soon?
  - Converted milk tanks are slower to heat.
- Did you want to make an outstanding product?
  - Triple wall vats allow for uniform heating.



# Selecting equipment – Cheese Presses

- Where do you want to go today?
  - Presses are not rocket science – You may want to build your own.
  - Mechanical verses air-powered.
  - Semi-hard cheese versus hard cheese requires vastly different pressing capabilities.
  - Large presses available used / small presses primarily available new.
  - Know the capacity that you need and the style that works best for your cheese.
    - 3 psi to 15 psi
    - Horizontal or Vertical
    - Single or multiple press plates



# Selecting equipment – Cup Fillers

---

- Required for Grade A products
  - Yogurt
  - Cream cheese
- Must fill and seal mechanically.
- Small-scale used ones are hard to find.
- Generally rotary in design.

# Don't get burned

- The used equipment market is subject to a lot of abuses – we have heard our share of horror stories.
- You spell assume with two dollar signs (a\$\$ume).
- Look before you leap.
- May common sense prevail.
- Work with someone who understands and appreciates what you want to do.

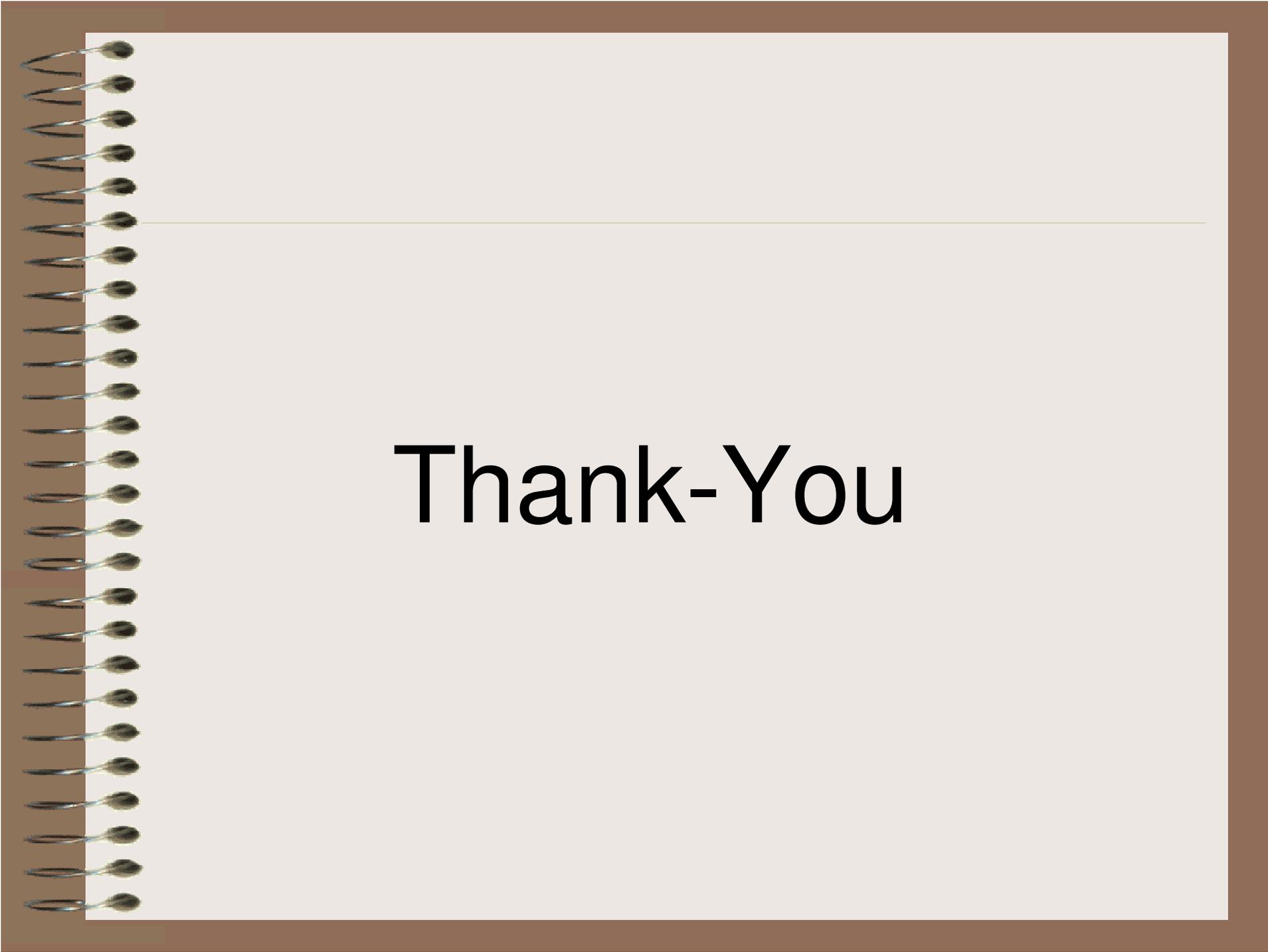


# How do you feel now?

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- Confused?
- Overwhelmed?
- Discouraged?
- Challenged?
- Ready to go for it anyway?
- *All of the above?*

**You must be an entrepreneur!**

A spiral-bound notebook with a brown cover and a light beige page. The spiral binding is on the left side. The text "Thank-You" is written in the center of the page.

Thank-You