# ***STANDARD OPERATING PROCEDURE – Production of Pasteurized Milk Cheese***

**Comment [MW1]:** NOTE: This sample SOP details the procedures for a pasteurized milk cheddar. Some parts may need to be adjusted for other styles of pasteurized milk cheeses

**FILE NAME: Location on your computer/company network**

**Authored by: Rob Ralyea**

**Comment [MW2]:** NOTE: add updated author

**Last Modified on: 06/07/2013**

EFFECTIVE DATE: Date of Approval

APPROVED BY: _____

QA Manager or Plant Manager/Owner

## SECTION 1: INTRODUCTION

### 1.1. Purpose

To establish rigid procedures to be followed during the cheese making process for pasteurized cheeses in (insert plant or company name here). A strict record of all proceedings shall be made so that food safety/quality issues might be addressed.

Comment [MW3]: NOTE: insert plant or company name here

### 1.2. Scope

This SOP applies to XXXX cheese produced at the (insert company name here) and all employees that are involved in the production of this cheese.

Comment [MW4]: NOTE: insert type of cheese here (e.g., Havarthi, cheddar)

Comment [MW5]: NOTE: insert plant or company name here

### 1.3 Other Applicable References

A. Good Manufacturing Practices
B. Sanitation Standing Operating Procedures
C. Taking Measurements with pH meter SOP

## SECTION 2: MATERIALS

### 2.1 Supplies

A. Milk.
B. Appropriate cultures, rennet, calcium chloride, salt, other ingredients as needed.

Comment [MW6]: NOTE: Add details here

### 2.2 Equipment

A. Jacketed cheese vat w/ paddles (automated)
B. Milling machine.
C. Cheese vat strainer
D. pH meter
   1. calibration buffers
   2. sterile/distilled water
E. Calibrated thermometer(s)
F. Cheese press
G. Moulds (XXX molds, XXXX company)
H. Cheese knives
I. Vacuum bags (_____)

Comment [MW7]: NOTE: insert mould manufacturer; as type of mould including size of drainage holes will affect the final product

Comment [MW8]: NOTE: insert manufacturer and gas permeability

## SECTION 3: PROCEDURES

### 3.1 Cheese making preparation

A. In a clean and properly sanitized vat, add pasteurized milk volume. Take initial pH reading and record it.
B. Warm milk to 90.0°F while gently mixing.

Comment [MW9]: NOTE: insert appropriate temperature as temperature may differ depending on starter culture used

**3.2 Fermentation**

A. Record lot numbers of cultures and calcium chloride on the make sheet (see Appendix A for make sheet).

B. Add culture(s) at the appropriate amounts. See make sheet for standards as mathematical calculations are required based on milk volume for all ingredients. Cultures are added at a rate of _____.

C. Stir vat for 5-10 minutes to ensure adequate and complete distribution of culture. Maintain heat on vat +/- 1°F during fermentation stage. Fermentation stage takes approximately 45-60 minutes.

D. pH measurements must be taken at the intervals specified in the make sheet and recorded to ensure the culture is functioning and there is an increase in acidity. Record this reading on the make sheet. Add calcium chloride. Calcium chloride is added at a rate of _____.

**3.3 Coagulation**

A. Record lot number of rennet/coagulant on the make sheet.

B. Upon attaining a pH of 6.57-6.61, add rennet (or coagulant of choice) to milk and stir for 2-4 minutes. Maintain temperature at 89-90°F (+/-1°F) to ensure rennet functions at the same level between production lots (enzymatic reactions are temperature sensitive). Rennet is added at a rate of _____. Rennet set takes 30-45 minutes with properly function enzyme. Determining when the curd is ready to cut must be determined and takes expertise and experience.

**3.4 Cutting**

A. Using a clean and sanitized cheese knife cut the curd first with the horizontal cheese knife the length of the vat.

B. Using a clean and sanitized cheese knife cut the curd next with the vertical cheese knife the length of the vat.

C. Finally, using the vertical knife, cut the curd across the vat. Ensure that all cheese has been cut and a uniform cube size throughout has been obtained. Take some cheese out and measure pH and record on make sheet.

**3.5 Healing**

A. Allow the curd to heal after cutting for approximately 5 minutes. This is done by not agitating or heating.

B. Allow the curd to heal for another 10 minutes, but at this time with very gentle stirring (lowest stir setting on the vat) to keep the curd from coagulating back together. Take a pH reading and record.

**3.6 Cooking**

A. Increase temperature gradually from the current temperature (should be 88-90°F range) to 94°F over 15 minutes with very gentle stirring.

B. Increase temperature gradually from 94°F to 102°F over 15 minutes, gradually increasing the rate of stirring during this time. Cheese should continue to be cooked at 102°F until a pH of 6.35.

**Comment [MW10]:** NOTE: insert rate appropriate for the product this SOP applies to

**Comment [MW11]:** NOTE: insert rate appropriate for the product this SOP applies to

**Comment [MW12]:** NOTE: insert rate appropriate for the product this SOP applies to

**3.7 Draining**

A. Place a clean and sanitized drain strainer in vat to keep cheese in the vat. Open the drain and drain off whey. Pull cheese curd up against vat sides to help facilitate whey draining. Allow cheese to drain in a mat for 15 minutes. This also allows the curd mat to knit back together.
B. Cut mat into manageable pieces (5-10 lbs) for the cheddaring process. Take a pH reading and record.

**3.8 Cheddaring**

A. Cheddaring is a term that means nothing more than flipping cheese curd mats to facilitate whey draining. The manageable curd mats as the cheddaring process goes on are stacked so that the added weight/pressure helps push out more whey. The pieces are cheddared every 15 minutes for as many times as it takes for the pH to drop to the 5.35-5.40 range.

**3.9 Milling**

A. After reaching a pH of 5.35-5.40, the cheddared pieces are milled using a clean and sanitary milling machine. CAUTION: Milling machine has moving parts and spinning blades!

**3.10 Salting**

A. Record lot number and manufacturer of salt on the make sheet.
B. Salt concentration must be calculated based on the volume of milk that you started with. Salt is added at a rate of _____. Salt should be split into several applications to ensure proper distribution. For vats <100 gallons, 2 applications can be done, for >100 gallons, 4 applications should be made.
C. Add first salt application (~ ¼ of salt total) and mix thoroughly. Wait 5 minutes.
D. Add second salt application (~ ¼ of salt total) and mix thoroughly. Wait 5 minutes.
E. Add third salt application (~ ¼ of salt total) and mix thoroughly. Wait 5 minutes.
F. Add fourth salt application (~ ¼ of salt total) and mix thoroughly. Wait 5 minutes.
G. Take pH reading and record it on the make sheet. Moulding should occur when the pH is at approximately 5.25.

**Comment [MW13]:** NOTE: insert rate appropriate for the product this SOP applies to

**3.11 Moulding**

A. Sanitize hands and put on gloves. Sanitize gloves. Place cheese into moulds as required being careful not to contaminate the cheese in the process. Moulds should be clean and sanitary as well as any equipment/utensils being used for this process.
B. On the make sheet in NOTES, RECORD how much cheese was made (IE: 5-20 lb blocks, 30-2 lb wheels, 6-5 lb bags of curd). This becomes important for traceability and recall situations, if ever required.

**3.12 Pressing**

A. Place moulds into the press with their tops up (insert is considered the top).
B. Initial pressure on the cheese should be set at 10 lbs.
C. After 1 hour, increase the pressure to 20 lbs.
D. After 1 more hour, increase the pressure to 30 lbs. Leave the cheese at room temperature in the press overnight.

**3.13 Aging**

**Comment [MW14]:** NOTE: aging procedures may differ by cheese styles and this section may need to be modified accordingly. For example, packaging in vacuum bags may not be performed with some cheeses

A. Take cheese out of moulds and place in aging room. Take pH reading and record it.
B. Age for approximately 2-3 days to dry.
B. Place cheese in vacuum bags and secure vacuum at _____PSI of vacuum (setting on machine are _____).
C. Age for the appropriate amount of time, flipping the cheese for even aging every week.
D. Sample the cheese monthly after month #3 to ensure flavor profile/development is occurring.
E. Take pH reading at every sampling and record it. This will help to make a consistent product.

Comment [MW15]: NOTE: insert PSI used

Comment [MW16]: NOTE: insert appropriate settings

## SECTION 4: RECORD KEEPING

### 4.1 Cheese Make Sheet.

A. A written make sheet will be completed each time cheese is made in the facility. Any variation, special event or other change/anomaly to the make process shall be recorded. A generic make sheet is attached. This report shall be maintained on the premises for as long as the cheese is believed to be in circulation.

B. An electronic make sheet database is recommended but not required. If one is maintained, it can be accessed at _____.

Comment [MW17]: NOTE: insert file location

### 4.2 Pasteurization Records.

A. Pasteurizer charts shall be maintained for at least 90 days, in accordance with current regulatory guidance for pasteurization of milk. They shall be accessible for as long as the cheese is believed to be in commerce.

### 4.3. Lot Numbers

A. Each individual batch should have a lot number assigned. This lot number becomes critical for traceability if a recall is ever necessary.

1. If more than one type of cheese is made on a particular day, different lot numbers must be assigned.
2. The exact output of a particular batch should go in the notes section of the make sheet.

B. A lot will be identified by the date it was made. For example, all cheese made from one vat will be identified by the date using the format dd/mon/yr (i.e., 11 Jun 13). If more than one vat is made, a letter will be added to the end (i.e., 11 Jun 13A). The appropriate lot number must also be recorded on the make sheet.

## SECTION 5: TROUBLE SHOOTING

Comment [MW18]: NOTE: users should add problems they encountered and resolutions here.

This section briefly outlines issues that could be encountered and have been encountered and how to address them

### 5.1. pH does not drop at the same speed as typically observed

While a slowed pH drop typically indicates that the starter culture is not fermenting at the expected speed, this observation may also be due to technical issues, such as a pH meter that is not properly functioning. Key things to check when a slowed pH drop occurs are

(1) Review antibiotic residue test in raw milk to assure that no antibiotics were present in the milk (antibiotics can inhibit the starter cultures)

(2) Check sanitation procedures to make sure that no sanitizer that leaves residues (e.g., quaternary ammonium) was used on cheese vat
(3) Double check calculation for the amount of starter cultures added (addition of reduced levels of starter cultures will slow down the fermentation
(4) Check calibration of pH meter
(5) Check calibration of thermometer and temperature records of cheese vat during fermentation (deviation from the standard temperature, both higher and lower temperatures will significantly affect the fermentation time and pH development)

**5.2. Cheese does not coagulate after adding rennet/coagulant**
Possible causes for this problem include:
A. Use of an old coagulant or a coagulant that has been temperature abused (thawed/frozen). Both of these issues can negatively affect the ability of the coagulant to cause curd to form.
B. Use of temperatures that are higher or lower than specified at the coagulations step; this can slow down or completely stop the coagulation reaction.

**5.3 Whey looks too white, or milky**
A. During the cooking phase the curd was mixed to hard and "beaten up" before it had a chance to firm up.
B. The cooking step was too slow.
C. The cut occurred too early, or the cutting method was too rough.

The following individual is responsible for implementation of this SSOP and has overall authority on-site:

Name: _____ Title: _____

Date: _____

# Cheese Name Here

**DATE:**

| MILK | | |
|---|---|---|
| VAT | | |
| Milk Volume | | |
| Milk Butterfat | | |
| Milk pH | | |
| Milk coliform | | |
| Protein | | |
| SCC | | |
| Pre-Draw Whey BF% | | |

**COMMENTS:**

| STARTER CULTURE | VOLUME | LOT NUMBER | TARGET |
|---|---|---|---|
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |

**OTHER INGREDIENTS**

| Product | Volume | Lot Number | |
|---|---|---|---|
| Rennet | | | |
| CaCL | | | |
| Salt | | | |
| | | | |
| | | | |
| | | | |

| CHEESE ANALYSIS | | |
|---|---|---|
| Butterfat % | | |
| Moisture % | | |
| pH | | |
| Salt | | |
| Coliform | | |

| QUALITY EVALUATION | | | | |
|---|---|---|---|---|
| Flavor | | | | |
| Body | | | | |
| Texture | | | | |
| Appearance | | | | |

NOTES:

| STEP | TIME | FROM | TO | Minutes | Temp (F) | pH | TARGET |
|---|---|---|---|---|---|---|---|
| **Ripen** | x min | | | | | | ph /Temp |
| add coagulant | | | | | | | |
| **Set** | x min | | | | | | |
| **Cut** | x min | | | | | | ph /Temp |
| **Heal** | | | | | | | |
| *No heat no Stir* | x min | | | | | | |
| *stir gently with no heat* | x min | | | | | | |
| **Cook--Stage 1** | | | | | | | Temp |
| Increase temperature gradually from x-yF over x minutes | | | | | | | |
| **Cook- Stage 2** | x min | | | | | | Temp |
| *Increase temperature from x-yF over x minutes* | | | | | | | |
| **Stir out** | | | | | | | pH |
| **Drain** | x min | | | | | | |
| **Cheddar** | | | | | | | |
| Knitting of curd | x min | | | | | | |
| Cheddar-first flip | x min | | | | | | pH |
| Cheddar-second flip | x min | | | | | | |
| Cheddar-third flip | x min | | | | | | pH |
| Cheddar-fourth flip | x min | | | | | | |
| Cheddar-fifth flip | x min | | | | | | |
| cheddar--sixth flip | x min | | | | | | pH |
| Cheddar--seventh flip | x min | | | | | | |
| **Mill** | | | | | | | pH |
| Salt (1st application) | x min | | | | | | |
| Salt (2nd application) | x min | | | | | | pH |
| **Mould Fill** | | | | | | | |
| Mould Press | | | | | | | |
| Pre-Cure | | | | | | | |
| Cure or Age | | | | | | | |

NOTES: