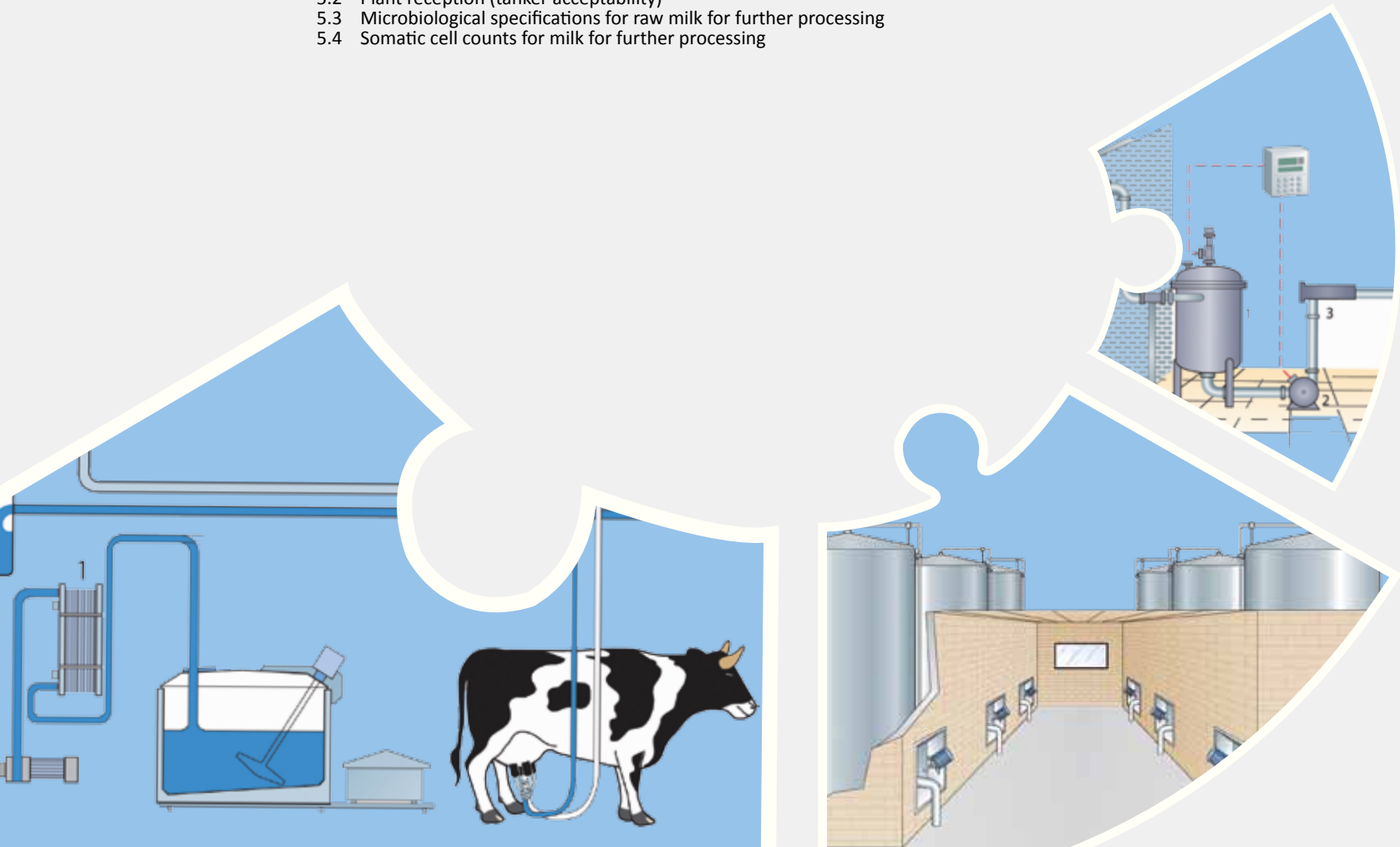




CHAPTER 2

COLLECTION AND RECEPTION OF MILK

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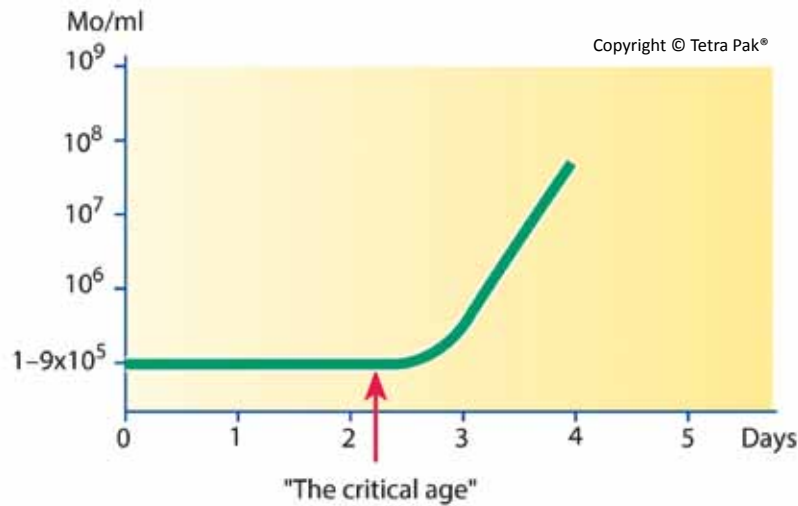


Chapter 2: Collection and Reception of Milk

1. Introduction

Milk is collected and transported over large geographical areas to various processing plants in South Africa. Given that milk is an ideal growth medium for microorganisms, care should be exercised to prevent microbiological deterioration.

Figure 1: Bacteria growth at +4°C in raw milk



The risk of rapid microbiological deterioration is present from the time of milking to the time of processing. It is therefore essential that raw milk be of a high microbiological quality and handled hygienically to prevent and minimise contamination.

Figure 2: General design of pipeline milking system

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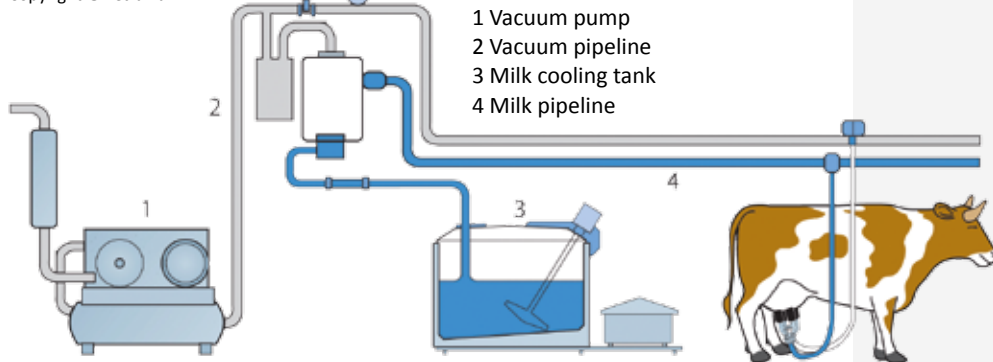
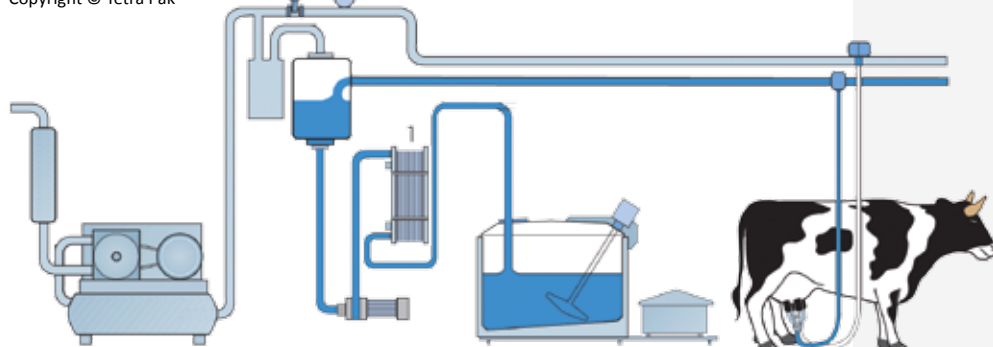


Figure 3: Milking equipment on a large farm with heat exchanger for rapid chilling from 37 to 4°C

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SANS 100498.2, 8.3
SANS ISO TS 22002-1, 9
CGCSA FSI GMCP BA.1.1,
I.A.7, I.A.8

R 961, 2, 9

R 961, 11
Chapter 7

R 961, 11
SANS 314
SANS ISO 707

2. Collection of raw milk

2.1 Supplier selection

The safety and quality of the final dairy product sold to the consumer is significantly impacted by the safety and quality of the raw milk.

A formal process of supplier selection should be in place to ensure that only reputable producers of raw milk are used and that the raw milk complies with the specifications defined by law and the processor.

Approved suppliers must conform to the following requirements:

1. The milking sheds must be registered and must have been issued with a certificate of acceptability.
2. The cows must not be suffering from tuberculosis and brucellosis. (Declaration certificates to confirm this must be available and must be up to date.)
3. Cows must be free from any contagious diseases that can be transferred to humans through the milk.
4. Cows must not be suffering from clinical mastitis or be treated for mastitis.
5. Cows that are being treated with antibiotics or other veterinary drugs that can be transferred to the milk, can only be used to supply milk after expiry of the prescribed withholding period following such treatment. Such treatments should be subject to proper supervision and support from relevant authorities.
6. Cows must not be suffering from udder infections or tissue damage.

2.2 Access to the farm

Milk can be collected by bulk milk collection tankers or by using milk cans. The condition of the access road to the location of collection should be conducive to hygienic collection practices. The road should have a hard, preferably paved surface and effective effluent drainage, and must be clear of manure.

As far as is practicable, the tanker driver should avoid contact with contamination sources, e.g. heaps of manure or silage on the route.

Any contamination issues should be discussed with the farm manager for mutual benefit in terms of milk quality.

2.3 Collection at the farm

The driver of the vehicle used to transport the raw milk to the facility is required to take a sample of the milk to be loaded. The temperature of the sample must be measured and an Alizarol test must be carried out on the sample, prior to accepting the milk.

If the temperature of the milk is above 5°C or the Alizarol test is positive, the milk cannot be accepted. If the milk is acceptable for loading, the driver must take another sample for further testing at the processing facility.

The samples must be taken in the correct way to ensure accurate results.

The driver is required to take a sample from every milking shed where milk is collected and mark every sample with the identification of the milking shed. These samples must be transported in such a way that the samples' temperature does not exceed 5°C at the final destination.

Figure 4: Bulk collection at the farm
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2.4 Transport to the processing facility

Milk should be transported to the processing facility in such conditions that the microbiological quality of the milk is not compromised. Manholes and dust caps on offloading pipes should be tightly closed, and the transport should be direct and without any unnecessary delay.

During transportation, the temperature of the milk should not exceed 7°C.

It is recommended that milk collection tankers should be designed and constructed according to the IDF Code of Practice for the Design and Construction of Milk Collection Tankers.

The driver must ensure that the tanker or milk cans are cleaned and sanitised prior to collecting milk, to prevent the tanker from becoming the source of contamination.

The interior and exterior of the milk tanker and the milk cans should be cleaned and sanitised either daily or whenever there is a four-hour or longer delay between collections. The sufficiency/efficiency of cleaning and sanitising of equipment should be checked regularly by inspection and microbial counts (swabs) to ensure that the level of microorganisms does not exceed 10 bacteria colony-forming units (CFU's) per 100 mm².

The milk tanker must be inspected daily and these inspections should include the following:

- Physical inspection for cracks and damage where microorganisms can multiply.
- Microbiological inspection (swabs) inside the tanker (after the cleaning and sanitising programme).

Inspection records must be signed off by the responsible person at the processing facility and all records must be kept on file.

2.5 The tanker driver

Given the emphasis on the tanker driver in legislation, it is imperative that the driver receives sufficient instructions and training in the hygienic handling of milk as well as personal hygiene.

R 961, 4
SANS 1187
SANS 10049, 8.11
SANS ISO TS 22002-1, 16.3
CGCSA FSI GMCP I.B.4.4-4.9
IDF Document 128

R 961, 11
SANS 5763
Chapter 7

R 961
SANS 10049, 7.5.1
SANS ISO TS 22002-1, 13.8
CGCSA FSI GMCP I.A. 9.1

SANS 10049, 7.5.2, 7.5.3
SANS ISO TS 22002-1, 13.4,
13.5, 13.6
CGCSA FSI GMCP B.B.1

R 961, 11
SANS 10049, 8.8
SANS ISO TS 22002-1, 14.2
CGCSA FSI GMCP B.A.2.3
Chapter 7

R 1555
SANS 10049, 8.5
SANS ISO TS 22002-1, 9.3
Chapter 7

R 962, Annexure D

SANS 10049, 9.2
SANS ISO TS 22002-1, 9.3
CGCSA-FSI GMCP B.A.4.1

R 1555
SANS 10049, 4

R 1555

The driver must wear clean working clothing and must not handle milk if suffering from infections or contagious diseases, which involve a risk of contamination of the raw milk.

The driver should not have access to stables or other areas where animals are kept, or areas where dung or manure residue is found. Contamination of clothes and shoes with manure must be avoided; If it does occur, the clothes and shoes should be cleaned or changed before work is continued.

2.6 Traceability

Traceability starts on the farm. Samples must be taken from each supplier as a legal requirement. A standard process for identifying the individual milk samples taken for analysis should be adhered to. These samples can be used to trace the supplier, for instance, that does not adhere to the withdrawal periods of antibiotics used for treatment of cows with mastitis.

3. Reception at the processing facility

3.1 Platform acceptance/rejection criteria

On receipt, raw milk should be subjected to immediate organoleptic and other quality tests so as to detect serious quality failures.

3.1.1 Reception tests

These tests should be performed before the milk is offloaded.

- Temperature of raw milk.
- Alizarol (68% min)/Ethanol stability.
- Organoleptic.
- pH.
- Titratable acidity.
- Resazurin.
- Antibiotics/inhibitory substances.
- Added water.
- Bacterial counts/total bacterial count, coliforms, *E.coli*.

The temperature of raw milk should be below 7°C, unless otherwise specified by the processing facility.

3.1.2 Milk suspected of being adulterated or heavily contaminated should not be accepted

A policy and procedure for disposal of above mentioned milk must be available.

3.2 Regulations relating to raw milk for further processing

- ! It is illegal to process milk that does not fully comply with the requirements of Regulation R 1555.

Milk should be produced in hygienic conditions by healthy animals and should be free from unacceptable levels of antibiotics and chemical residues (according to legislative requirements), extraneous matter, objectionable odours and taints, and should be of an acceptable microbiological quality.

Special attention should be paid to the microbiological quality of the raw milk if this milk is not to be pasteurised. Such milk must comply with the regulations and standards set out to ensure that it does not present a

hazard for consumers. Special attention should be given to pathogenic microorganisms such as *Salmonella*, *Listeria monocytogenes*, pathogenic *E. coli* and *Staphylococcus aureus*.

3.3 Milk receiving area

Milk collection tankers and transportation cans, which are often soiled by the farm environment, must be recognised as carriers of pathogenic and other undesirable bacteria. Contamination from this source may be deposited on the yards and traffic areas of the dairy plant. Therefore, driveways and traffic areas should have a smooth and hard paved surface to keep dust, water and mud to a minimum. Suitable slopes to prevent accumulation of water should be secured.

The area of discharging milk tankers and milk cans should have facilities that prevent accumulation of water and raw milk spillages as well as adequate drainage. Provisions should be made to allow rinsing of the area. Traffic and discharge areas should be frequently inspected for any damage, which should be repaired immediately.

Discharging of milk tankers and milk cans should be carried out without presenting any risk of contamination of the milk, e.g. dusty areas or the presence of insects, birds or rodents.

It is recommended that the exteriors of the milk tanker and cans are rinsed with water before arriving at the discharge facilities in the delivery area.

Once the tanker arrives at the processing facility, the milk will be pumped into storage silos.

The milk should be transferred from the milk tanker into the dairy building via a closed hose or pipe. Any milk residues in the discharge area should be removed before departure.

After discharging, the milk tanker and milk cans must be cleaned and sanitised. This should preferably be done at special cleaning facilities separate from the discharge area. Special consideration should be given to cleaning the sampling equipment of the tanker. A minor cleaning programme may be carried out during the day, but a thorough cleaning programme should take place at least daily.

The driver should not be permitted into the production rooms of the dairy or milk products. Arrangements should be made to allow communication with the staff of the dairy to deliver the raw milk samples.

3.4 Payment according to quality

The improvement of raw milk quality at the farm level is closely linked to financial consequences. The pricing of milk should serve to motivate milk producers to increase their efforts in hygienic milking practices and handling of raw milk. It is therefore recommended that payment of milk is structured according to its microbiological quality, measured by internationally recognised methods.

The farm manager is responsible for supplying good quality raw milk, by law, and must put in place the necessary procedures to ensure such quality.

SANS 10049, 10.1
 SANS ISO 22000, 7.10
 CGCSA FSI GMCP B.A. 5
 SANS 10049, 8.5
 SANS ISO 22000 7.10
 CGCSA FSI GMCP I.A 6
 Chapter 7

The processor should give formal feedback to the farm manager on the quality of the incoming milk and take appropriate action if the quality does not improve. Records of this should be available.

The processor should do a microbiological analysis on raw milk at least once a week.

4. Raw milk handling at the processing facility

4.1 General aspects

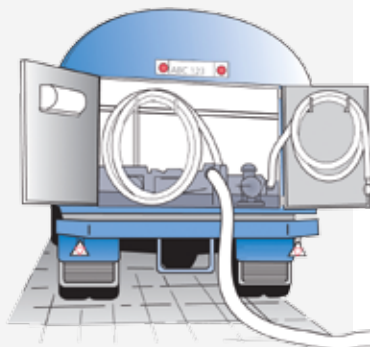
Ideally, raw milk should be subjected to a heat treatment within four hours or be stored under controlled conditions.

4.1.1 Filter/strainer

Incoming milk should be clarified or filtered by a rough inline filter before storage and treatment. Such filters should be sanitised daily in order to avoid cross-contamination of the raw milk received at a later stage.

The filter is intended for coarse clarification of the raw milk to remove gross impurities (approximately 100 micron) that could impair the efficiency of downstream dairy processing.

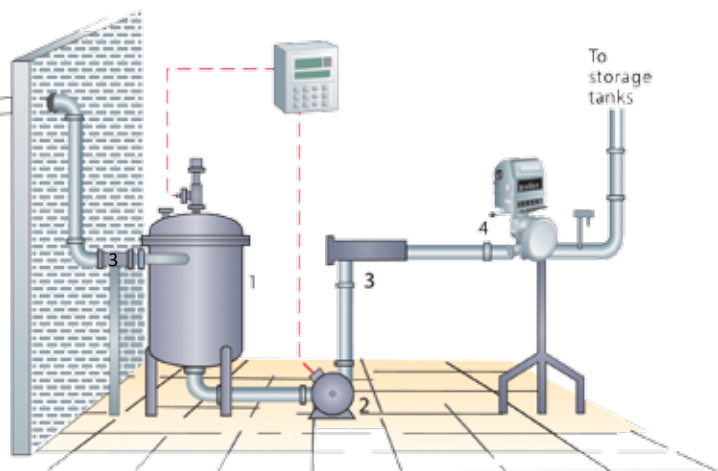
The preferred product choice would be a stainless steel filter bag, cartridge or strainer or else a cleanable stainless steel filter. The purpose of this strainer is to protect the pumps from damage.



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Figure 5: Measuring by volume

- 1 Air eliminator
- 2 Pump
- 3 Filter
- 4 Metering device



4.1.2 Cross-contamination in the facility

Raw milk should be regarded as potentially contaminated with pathogenic bacteria. Food safety measures should therefore be implemented to prevent cross-contamination from areas where raw milk is handled, stored or processed to areas where pasteurised products or partly processed products are handled, processed or kept.

4.1.3 Zoning

Areas where raw milk is handled, stored or processed should be separated either by walls or by adequate signs from areas where pasteurised products are exposed.

SANS 10049, 7.2.1.2
 SANS ISO TS 22002-1, 10
 CGCSA FSI GMCP B.A.4.1

SANS ISO TS 22002-1, 10.2
 CGCSA FSI GMCP B.A.4.1

4.2 Storage of raw milk

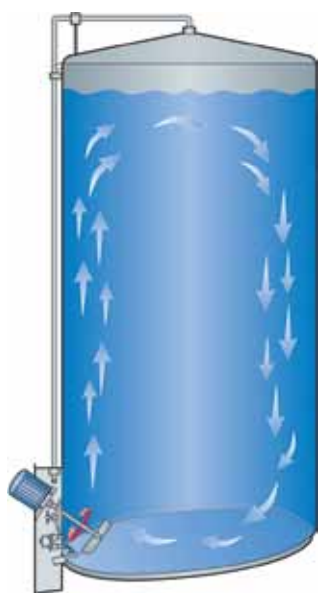
Milk intended for heat treatment, but which is not subjected to such heat treatment within four hours from the time of reception, should be cooled immediately after reception and kept refrigerated below 5°C, preferably at a lower temperature.

If not processed immediately, raw milk should be heat-treated within 48 hours from the time of receiving. Mixing stored raw milk with newly received raw milk should be discouraged. Storage tanks should be thoroughly emptied, cleaned and sanitised before new raw milk is conveyed into the tank. Each day's deliveries should be stored separately and mixing should be avoided.

Raw milk in storage should not be processed if it has been subjected to severe microbiological deterioration, which can be the result of time delays or temperature abuse. This is normally checked by conducting pH, Alizarol or titratable acidity tests again, prior to use.

The design of storage tanks must ensure that the raw milk is not contaminated. Vertical storage tanks constructed of stainless steel are best practice. Plastic is not recommended. Insulation is important to maintain the temperature of the milk, and this is normally in the form of double-walled tanks or water jacket cooling. Gentle agitation is also required but level control equipment should be in place to ensure that the milk does not become aerated. Storage tanks should be kept closed at all times. Inlet valves and pipe work must be kept in a hygienic condition.

Figure 6: Silo tank with propeller agitator



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Figure 6.9.1: Layout of outdoor silo tanks with their manholes in alcoves in the walls of a covered control station



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4.3 Prevention of cross-contamination

Personnel working in raw milk areas may be the source of contamination from such areas to processing or finished-product areas. Therefore, personnel moving from a raw milk area to one where pasteurised products are exposed should wash their hands and change clothing. Footwear should either be changed or sanitised.

Consequently, appropriate methods of communication should be established between such personnel and personnel employed in processing areas beyond the pasteurisation line.

SANS 10049, 8.6
SANS ISO TS 22002-1, 16.2

SANS 10049, 8.7
Chapter 7

R 961, 7
SANS 10049, 7.2.11
SANS ISO TS 22002-1, 5.7
SANS 708
CGCSA FSI GMCP I.B 4.1-4.3

SANS 10049, 7.2.1, 7.2.10
SANS ISO TS 22002-1, 13
CGCSA FSI GMCP B.B 4

All equipment, gear and utensils that have been in contact with raw milk or have been present in raw milk areas, should be cleaned and sanitised before use. Such tools and cleaning utensils should preferably be kept in raw milk areas and not be used elsewhere.

A colour-coded system (red is recommended for raw milk) should be implemented to separate cleaning utensils from other areas and to prevent cross-contamination. Cleaning utensils must be marked accordingly.

Cleaning-in-place (CIP) systems or local automatic cleaning systems for the cleaning and sanitising of equipment, storage facilities etc. of raw milk must not be connected with similar systems for cleaning equipment of pasteurised products.

Ideally, separate CIP sets should be provided for:

1. Milk tankers and raw milk silos.
2. Pasteurisation equipment and associated pipelines.
3. Product pipelines and equipment.

The use of high-pressure cleaning should not be allowed in raw milk areas due to the risk of spreading contaminated droplets (aerosols).

In order to direct airflow towards raw milk areas, positive air pressure in rooms where raw milk is present should not exceed air pressure in rooms where pasteurised products are processed or kept. In other words, the direction of airflow should NOT be from the “dirty area” to the cleaner area.

5. Standards for raw milk

5.1 On-farm milk collection

Test	Specification
1. Organoleptic (smell)	No taints or odours
2. Temperature	≤5°C (legally specified and ideal)
3. Alizarol	68% min (v/v) or as required from product specifications
4. Sediment/insects	Absent

5.2 Plant reception (tanker acceptability)

Test	Specification
1. Inhibitory substances	Negative (reject if positive)
2. Alizarol (confirm with Resazurin)	As recommended by raw milk specifications – 68% (75% UTH, 72% fresh, 70% all other)
3. Resazurin	Disk 6, 10 minutes should milk fail Alizarol
4. Temperature	≤7°C
5. Titratable acidity (if >0,19 but pass all other tests, accept)	0,15%–0,18%
6. pH (if outside specifications, but pass all other tests, accept)	6,70–6,80
7. Organoleptic (smell)	No taints or odours
8. Freezing point	≤ -0,512°C
9. Added water	0%
10. Aflatoxin M1	<0,5 ppb

11. TB and Brucellosis certificates	Valid
12. Butterfat	>3,3%
13. Heavy metals – lead	<0,02 ppm
14. Melamine	Absent
15. Pesticide residues	Absent

5.3 Microbiological specifications for raw milk for further processing

Standard	Requirement cfu/ml	Recommended cfu/ml
Total bacterial count (TBC) at the farm bulk tank	<200 000	<50 000
Total bacterial count (TBC) for individual cows	<200 000	<50 000
Total bacterial count (TBC) for tanker milk delivered at the processing facility	<200 000	<100 000
Coliforms	<20 (MPN)	50
<i>E.coli</i>	Absent in 1 ml	Absent
Pathogens	Absent	Absent

R 1555

5.4 Somatic cell counts for milk for further processing

Type of milk	Recommended SSC/ml
Cow's milk	<500 000
Goat's milk	<750 000

R 1555

IMPORTANT LINKS



HACCP

Remember to refer back to Chapter 1 to recap on the hazards identified and preventive measures in the handling of raw milk and the DVD



DOCUMENTATION

Remember to refer back to Chapter 12 and the DVD for more details on the suggested documentation required for raw milk handling



TESTING

Remember to refer back to Chapter 7 for more details on sampling and testing methods