



Australian Government

Department of Education, Employment and Workplace Relations

FDFCH4003A Produce a range of rennet-coagulated cheeses

Release: 2

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Modification History

April 2012: Minor typographical corrections.

Unit Descriptor

This unit of competency covers the skills and knowledge required to produce a range of rennet-coagulated cheeses to a commercial standard.

Application of the Unit

This unit applies to production managers with responsibility for developing operational procedures, controlling the cheese making process, and complying with occupational health and safety (OHS), food safety, record keeping and quality assurance requirements for rennet-coagulated cheeses. This unit includes all aspects of rennet-coagulated cheese production and cheese making equipment and ingredients.

Licensing/Regulatory Information

Not applicable.

Pre-Requisites

Not applicable.

Employability Skills Information

This unit contains employability skills.

Elements and Performance Criteria Pre-Content

Elements describe the essential outcomes of a unit of competency.

Performance criteria describe the performance needed to demonstrate achievement of the element. Where bold italicised text is used, further information is detailed in the required skills and knowledge section and the range statement. Assessment of performance is to be consistent with the evidence guide.

Elements and Performance Criteria

ELEMENT	PERFORMANCE CRITERIA
1. Manage sanitation in artisan cheese making	1.1 Container of starter culture is sanitised or pre-ripened under aseptic conditions before tipping the contents into the vat to reduce the risk of infection or contamination 1.2 All surfaces are kept clean and sanitised, except for curing boards 1.3 Stringent personal hygiene and quarantine procedures are applied as part of best manufacturing practice 1.4 Multi-phase cleaning systems are applied to ensure sanitised surfaces and equipment 1.5 Food safety related information is recorded, as required, including milk counts and cheese bacterial counts
2. Develop and implement procedures to prepare milk for artisan cheese making	2.1 Raw milk is sampled and composition and counts measured/analysed 2.2 Clarification and standardisation procedures for raw milk are implemented 2.3 Pasteurisation procedures for milk are carried out 2.4 Raw milk area is maintained separate from pasteurised milk operations
3. Mix ingredients in the vat for rennet-coagulated cheeses	3.1 Colour is added to the milk to change the colour of the cheese, if required 3.2 Mould spores are added for mould ripened cheeses, if required 3.3 Adjunct cultures are added to influence the texture and flavour of the ripened cheese, if required 3.4 Enzymes are added to alter the flavour profile of the ripened cheese, if required 3.5 The milk is acidified with organic or inorganic acids before renneting, if required (e.g. direct acidified Mozzarella or Bocconcini) 3.6 The milk is partly acidified with acid prior to adding culture to control the calcium phosphate level in the curd during cheese making, if required 3.7 Cultures and rennet are added to milk and held at required temperature 3.8 A log of pH and temperature is maintained
4. Cut and handle the curd for rennet-coagulated cheeses	4.1 Curd cutting is supervised to achieve optimal yield and the required moisture level in the cheese 4.2 Agitation and temperature of the curd and whey is monitored 4.3 The curd and whey is heated, if required, and checked for uneven or overheating, if heated

ELEMENT	PERFORMANCE CRITERIA
	4.4 The heating schedule is planned to ensure optimal syneresis 4.5 Part of the whey is removed and replaced with water to wash lactose and lactic acid from the curd, if required 4.6 For large and small eye cheeses (e.g. large eye type-Swiss and small eye type-Gouda) the curd is matted under the whey before the whey is removed to ensure proper eye development 4.7 All or part of the whey is removed from the curds by draining it out of the vat
5. Develop and implement salting, curing and packaging procedures	5.1 Procedures are implemented to prepare the curd for salting 5.2 Salting treatments are applied to ensure salt profile effects are minimised in the finished product 5.3 Dry salted stirred or milled curd particles are placed into moulds for pressing, if required 5.4 Ripening procedures are carried out and the process is monitored 5.5 Packaging is developed and applied for each cheese type
6. Monitor and adjust process control to produce cheese with consistent taste and quality	6.1 The process objectives of rennet-coagulated cheese making are established 6.2 Moisture control is achieved in the cheeses by the use of processing factors 6.3 The rate and the amount of acid development is controlled 6.4 Calcium phosphate levels are controlled to influence basic cheese structure 6.5 Texture of the cheese is controlled by regulating pH, ripening agents, salt, moisture and fat 6.6 Cheese flavour is controlled through choice of ingredients (milks, cultures, coagulating agents and salt) and pH levels 6.7 Process control parameters are used to achieve optimal yield 6.8 Aging of rennet-coagulated cheeses is applied to develop optimal flavour and texture
7. Carry out sensory analysis and grading of artisan rennet-coagulated cheeses	7.1 A range of flavours in cheese are identified 7.2 Different textures of cheeses are recognised 7.3 Cheese is assessed for evenness of colour and finish 7.4 Organoleptic properties of rennet-coagulated cheeses are analysed to identify possible changes to process controls
8. Meet workplace requirements for food safety, quality and environmental management	8.1 Food safety related information is recorded 8.2 Records of cheese manufacture are maintained 8.3 Health and safety and environmental protection procedures are developed through a risk management approach 8.4 Waste is disposed of and environmental impacts reviewed for the cheese making operation

Required Skills and Knowledge

This section describes the skills and knowledge required for this unit.

Required skills include:

Ability to:

- sample fresh milk and analyse results
- prepare milk for cheese making
- carry out standardisation and pasteurisation procedures
- adjust milk to renneting temperature and monitor temperature
- add optional additives to influence flavour, colour and texture during ripening
- add starter for acidification by lactic acid or acid for direct or part acidified milk for cheese making
- add rennet to promote coagulation
- test readiness of curd for cutting
- use stainless steel wire or nylon line knives to cut the curd into small particles
- carry out agitation and optional cooking procedure
- carry out cheese washing procedures
- carry out drainage operation
- carry out further curd treatment, depending on the cheese type
- carry out salting process
- manage process control for moisture, pH, calcium phosphate levels, microbiology, texture and flavour in rennet-coagulated cheese making
- carry out sampling for chemical and microbiological testing of cheese
- manage ripening process for rind cheeses, mould ripened cheeses and bacterial surface ripened cheeses for optimum quality
- assess rennet-coagulated cheeses for organoleptic qualities
- conduct tests for pH, moisture and salt levels in cheese
- maintain records for cheese making
- carry out packaging of cheese
- use multi-phase cleaning systems
- develop safe work practices and personal hygiene and sanitation procedures
- maintain the viability and integrity of coagulating agents and microbial additives
- calculate cheese yields
- develop packaging and labelling for rennet-coagulated cheeses
- comply with environmental requirements for a processing operation.

Required knowledge includes:

Knowledge of:

- the main cheese types and the common processes for making different types of rennet-coagulated cheeses
- the main components of milk and cheese (both curds and whey)

- types and impact of inhibitory substances in milk, including bacteriophage
- purpose and basic principles of cheese making
- specifications of product at each stage of rennet-coagulated cheese making
- milk characteristics and components important in cheese making
- milk preparation for cheese making (standardisation and pasteurisation)
- types of starters used and their role in the fermentation process
- types of adjunct cultures and their role in the flavour and texture characteristics of the ripened cheese
- use of additives to the milk for modifying the flavour, texture and colour of the ripened cheese
- effect of milk characteristics on cheese processing performance
- use of bacterial cultures and coagulating enzymes
- moisture control in cheese making
- processes of coagulation and syneresis and their role in rennet-coagulated cheese making
- critical control points in the manufacture of each cheese type
- principles of brine salting and maintenance of brine salting systems for brine salted cheeses
- principles of dry salting for dry salted cheeses
- effects of pH and temperature on cheese processing performance and product quality
- lactic acid bacteria and their role in cheese making
- microbial contaminants of cheese (lipolytic bacteria, yeasts, moulds, bacillus, listeria, E. coli, salmonella, coliforms and staphylococci) and their impact on cheese quality
- sampling and testing procedures for microbes
- yeasts and moulds and other microorganisms of significance in cheese making
- contamination/food safety risks associated with the process and related control measures
- techniques used to monitor the cheese making process, such as inspecting, measuring and testing
- common causes of variation and corrective action required for each cheese making process
- organoleptic properties and their relationship to process control and ingredients in cheese making
- sampling procedures
- contamination risk of inoculants and contaminants
- food safety and quality assurance standards and procedures
- yield efficiency
- cleaning and sanitation procedures in line with Australian standards for cleaning in the dairy industry
- routine maintenance procedures
- product/batch changeover procedures
- OHS hazards and controls
- procedures for recording production and performance information
- environmental issues and controls relevant to the process, including waste collection and handling procedures.

Evidence Guide

The evidence guide provides advice on assessment and must be read in conjunction with the performance criteria, required skills and knowledge, range statement and the Assessment Guidelines for the Training Package.

Overview of assessment	A person who demonstrates competency in this unit must be able to produce artisan rennet-coagulated cheeses to a commercial standard. Assessment cannot take place on fully integrated industrial equipment.
Critical aspects for assessment and evidence required to demonstrate competency in this unit	Critical aspects of assessment must include evidence of the ability to produce a range of rennet-coagulated cheeses including: - establishing procedures for: - sanitation, food safety, quality assurance and environmental management in rennet-coagulated cheese production - developing work instructions for: - preparing milk for cheese making - coagulating milk through renneting - ensuring a suitable rate of fermentation - carrying out manufacture and curing processes to optimal levels - packaging and labelling rennet-coagulated cheeses - carrying out sensory analysis of rennet-coagulated cheeses - reviewing process control based on sensory analysis and recovered yield.
Context of and specific resources for assessment	Assessment of performance requirements in this unit should be undertaken within the context of cheese production. Competency is demonstrated by performance of all stated criteria, including the critical aspects and knowledge and skills elaborated in the Evidence Guide, and within the scope as defined by the Range Statements applicable to the workplace environment. Assessment must occur in a real or simulated workplace where the assessee has access to: - production process and related equipment, including vats, stainless steel wire knives and milling machines, manufacturers' advice and product specifications - sampling and testing equipment and procedures

	• methods and related software systems, as required, for collecting data and calculating yields, efficiencies and material variances appropriate to the type of cheese and the production environment.
Method of assessment	The following assessment methods are suggested: • observation of candidate making rennet-coagulated cheeses • written and/or oral questioning to assess knowledge and understanding • workplace samples of rennet-coagulated cheeses with a documented history of process and a completed self-evaluation • composition analysis of milk and cheese samples • third-party supporting statement.
Guidance information for assessment	Evidence should be gathered over a period of time against a range of rennet-coagulated cheese products. Part of the evidence requirements for this unit requires that samples of at least three batches of rennet-coagulated cheeses be produced to a commercial standard, in a real or simulated environment. Students must be assessed on their ability to control all aspects of sanitation and materials storage and handling.

Range Statement

RANGE STATEMENT

The range statement relates to the unit of competency as a whole. It allows for different work environments and situations that may affect performance. Bold italicised wording, if used in the performance criteria, is detailed below. Essential operating conditions that may be present with training and assessment (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) may also be included.

Legislation	Legislative requirements are typically reflected in procedures and specifications. Legislation relevant to this industry includes: - the Food Standards Code, including labelling, weights and measures legislation - legislation covering food safety, environmental management, OHS, anti-discrimination and equal opportunity.
Policies and procedures	Work is carried out according to: - company procedures - regulatory and licensing requirements - legislative requirements - industrial awards and agreements.
Cheese tests	Cheese tests may include: - testing for pH levels, moisture levels, salt levels and fat and protein levels - microbiological testing - chemical testing - physical testing of cheese throughout production - testing for organoleptic properties.
Cheese types	Cheese types may include the range of rennet-coagulated cheeses including: - low heating temperature (<40°C) hard cheeses (e.g. Cheddar) - high temperature (>40°C) hard cheeses (e.g. Parmesan and Romano) - eye cheeses - mould ripened cheeses (e.g. Camembert and Blue) - bacterial surface ripened cheeses (e.g. Swiss Tilsit) - feta - past filata cheeses (e.g. Mozzarella).
Clarification procedures for raw milk	Clarification procedures for raw milk may include: - cloth filters - centrifugal clarifiers and separators

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	• bactofugation • membrane (micro) filtration.
Milk standardisation requirements	Milk standardisation requirements may: • include standardisation of microflora, fat and protein, and casein/fat rations • require the addition of skim milk or skim milk solids, or the separation of cream.
Pasteurisation methods	Pasteurisation methods may be: • batch or continuous.
Cheese inoculants	Cheese inoculants include: • the lactic acid bacteria which are added to the milk as a culture in inoculation.
Cheese additives	Cheese additives may be added to the milk after inoculation and include: • calcium chloride • nitrates • colour (e.g. Annatto is added to Cheddar style cheeses to make a more orange colour) • lipases • adjunct cultures (e.g. Propionibacteria added to milk for Swiss type cheeses results in the large eyes and characteristic flavour of these cheeses) • enzymes (e.g. the use of lipase in some Parmesan and Romano style cheeses).
Cheese adjuncts	Cheese adjuncts are microbial populations added to cheese in addition to the normal inoculants to: • provide consistency to flavour and texture • accelerate flavour development • produce specific attributes to meet market targets Adjunct cultures are essential for the correct ripening of the cheese.
Rennets	Rennets may include: • enzymes (mostly chymosin) from animal stomachs • chymosin fermented by genetically modified organisms • enzymes from microbial or plant sources.
Key composition ratios of cheese	Key composition ratios of cheese include: • salt to moisture ratio (S/M) • moisture in the non fat substance (MNFS)

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	- fat in the dry matter (FDM) - pH (acidity).
Process control parameters to optimise yield	Process control parameters to optimise yield include: - curd cutting and subsequent agitation - heating and cooking - high temperatures during pressing.
Principles of optimising yield	Principles of optimising yield include: - obtain highest MNFS with good quality - standardise milk (P/F) to obtain maximum value for milk components - minimise fat and protein losses in the whey.
Processing factors to achieve moisture control	Processing factors to achieve moisture control include: - cheese making time - curd particle size - cooking temperature.
Preparation of the curd	- For Cheddar and pasta filata cheeses, the curd particles may be allowed to matt before cutting and stacking as loaves, or stirred to prevent the particles from matting before the addition of dry salt. The loaves of matted curd are milled into small pieces before salting. The milled or stirred curd particles may be washed before salting - For pasta filata cheeses, salted, part salted or unsalted curd is heated to ~60°C to plasticise the curd (typically by stretching in hot water or brine). The plasticised cheese is then moulded into its desired shape and the part salted or unsalted cheeses salted further in a brine solution - For opened textured cheeses (e.g. Feta, Parmesan, Havarti, and most blue mould ripened cheeses) well drained curd is generally transferred from the vat into moulds before optional pressing - Eye and open textured cheese types are generally pressed before salting - For surface ripened soft cheeses (mould and/or bacteria), curd and part of the whey is transferred into moulds to form the shape of the cheese before salting.
Ripening procedures	Ripening procedures include: - for most hard cheeses: - the cheese may be sealed and allowed to ripen

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	under either temperature controlled conditions (for rindless cheeses) or allowed to ripen under temperature and humidity controlled conditions before the cheese is sealed (for rinded cheeses) - for white or blue mould ripened cheeses, soft bacterial surface ripened cheeses (e.g. Limburger) and hard bacterial surface ripened cheeses (e.g. Swiss Tilsit): - the cheeses are allowed to ripen under temperature and humidity controlled conditions before the cheese is generally packaged in aerobic packaging. Some blue mould cheese and bacterial surface ripened cheese styles may be sealed at some stage during ripening - feta cheeses: - are generally ripened in a salt brine.
Aging of hard cheeses	Aging of hard cheeses may be: from one to two months to several years Temperature must be monitored for rindless cheeses and temperature and humidity for rind, mould ripened and bacterial surface ripened cheeses.
Packaging	Packaging may include: - vacuum and/or gas flush in gas and moisture proof film - surface drying as a protective rind followed by waxing - oxygen permeable packaging for most mould and bacterial surface ripened cheese types.
Multi-phase cleaning systems	Multi-phase cleaning systems require: cleaning with a chlorinated alkaline detergent with a chelator, followed by water and acid rinses.
Records of cheese manufacture	Records of cheese manufacture may include: - timing of operations - temperature logging - milk and curd pH profile - curd weight - milk composition - cheese microbial counts - hooped yield - curing and grading data.

RANGE STATEMENT	
Food safety related information	Food safety related information may include: • milk counts • cheese bacterial counts • manufacture and storage details.
Cleaning standards	Cleaning standards include: • AS 4709 - 2001 Guide to cleaning and sanitising of plant and equipment in the food industry • AS 1162 - 2000 Cleaning and sanitising dairy factory equipment • AS 2541 - 1998 Guide to the cleaning-in-place of dairy factory equipment.

Unit Sector(s)

Cheese.