Title	**Explain a separation and standardisation process in a dairy processing operation**		
Level	**5**	**Credits**	**20**

Purpose	This theory-based unit standard is for experienced people carrying out milk product processing in a dairy processing operation. People credited with this unit standard are able to explain: the general principles and application of centrifugal separation; the principles of continuous disk bowl centrifugal separation; the design and modes of operation of centrifugal disk bowl separators; the operating principles of centrifugal decantors and cyclones; and the methods and principles of the standardisation of milk composition, in a dairy processing operation.

Classification	Dairy Processing > Milk Processing

Available grade	Achieved

Guidance Information

1 Legislation
Legislation relevant to this unit standard includes but is not limited to the Animal Products Act 1999, Health and Safety in Employment Act 1992, and Animal Products (Dairy) Regulations 2005.

2 Definitions
Separation – refers primarily to mechanical separation by centrifugal force.
Organisational requirements – instructions to staff on policies and procedures which are documented in memo or manual format and are available in the workplace. These requirements include but are not limited to – site specific requirements, manufacturer's specifications product quality specifications, and legislative requirements.

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Outcomes and performance criteria

Explain the general principles and application of centrifugal separation in a dairy processing operation.

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Performance criteria

1.1 The application of centrifugal separation is explained in terms of the physical conditions of the products to be separated.

Range separation includes but is not limited to – liquid to liquid, liquid to solid, gaseous to solid, gaseous to liquid;
evidence is required of a dairy industry application example for each separation.

1.2 The general principles of gravitational separation are explained in terms of sedimentation and flotation velocities according to Stokes' law.

1.3 The general principles of gravitational separation are explained in terms of factors influencing separation efficiency.

Range principles include but are not limited to – difference in relative densities, relative proportions of the continuous and dispersed phases, particle size and shape, viscosity, temperature.

1.4 The general principles of centrifugal separation are explained in terms of the substitution of centrifugal acceleration for gravitational acceleration in Stokes' law.

Outcome 2

Explain the principles of continuous disk bowl centrifugal separation in a dairy processing operation.

Performance criteria

2.1 Continuous disk bowl centrifugal separation of solid particles is explained in terms of how a solid particle moves in the liquid in the separation channels during separation and what determines the smallest separable particle size.

2.2 Continuous disk bowl centrifugal separation of milk is explained in terms of the distribution and entry of milk into the separation channels and the separation of sediment and fat globules according to their densities relative to that of the continuous skim milk medium.

2.3 Continuous disk bowl centrifugal separation of milk is explained in terms of the importance of skimming efficiency in relation to the expected end use of the separated fractions.

Range end use includes but is not limited to – standardised milk, skim milk for casein, skim milk powder, membrane processing of casein whey.

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2.4 Continuous disk bowl centrifugal separation of milk is explained in terms of factors affecting skimming efficiency and control of the fat content of cream.

Range factors include but are not limited to – fat test of whole milk, pumping and agitation of milk, age of milk, air incorporation, fat globule size, separation flow rate, separation temperature, high fat content in cream, outlet pressures, bowl speed, disk spacing, condition of disk stack.

Outcome 3

Explain the design and modes of operation of centrifugal disk bowl separators in a dairy processing operation.

Performance criteria

3.1 The design of centrifugal disk bowl separators is explained in terms of the functions of each of the main components.

Range components include but are not limited to – centrifuge bowl, disk holder, disk stack, separating disks, bowl lid, feed inlet and outlets.

3.2 The design and modes of operation of centrifugal disk bowl separators are explained in terms of similarities and differences between the features and outlet performances of semi-open and hermetic separators.

Range modes of operation include but are not limited to – feed inlet, flow control, exclusion of air, skim milk and cream discharge systems.

3.3 Modes of operation of centrifugal disk bowl separators are explained in terms of differences between semi-open and hermetic separators in the means of controlling the fat test of cream leaving the separator.

3.4 Design and modes of operation of centrifugal disk bowl separators are explained in terms of configurations for separation, clarification and mechanisms for continuous desludging.

Range mechanisms include but are not limited to – sliding bowl, nozzles.

3.5 Design and modes of operation of centrifugal disk bowl separators are explained in terms of configurations for functions other than skim milk and/or cream separations.

Range functions include but are not limited to – cream concentration, clarification (phase-inversion and separation), clarification, bactofugation, dense phase concentration (eg quarg).

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3.6 The operation of centrifugal disk bowl separators is explained in terms of typical operating problems, their likely causes and remedies.

Range typical operating problems include but are not limited to – bowl not coming up to speed, taking too long to come up to speed, vibration, bowl speed drops during separation, motor pulling high current, uneven run of separator, bowl not closing, bowl not opening properly, high fat content in skim, incorrect cream fat content;
evidence is required for four typical operating problems.

3.7 The operation of centrifugal disk bowl separators is explained in terms of typical safety precautions that must be followed during the operating routine and the reasons for them.

Range safety precautions include but are not limited to – pre-start checks, start and run-up checks, checks during separation and cleaning, checks at stop of separator.

Outcome 4

Explain the operating principles of centrifugal decantors and cyclones in a dairy processing operation.

Performance criteria

4.1 The operating principles of decanting centrifuges are explained in terms of typical liquid feed configuration, separation pathways, mechanisms for adjusting the decanting proportions, typical applications, and factors affecting decanting efficiency.

4.2 The operating principles of centrifugal cyclones are explained in terms of their fixed-housing and tangential entry configuration, and separation pathways.

Range operating principles include but are not limited to – separation of milk concentrate from vapour, separation of dust particles from air.

4.3 The operating principles of centrifugal dust cyclones are explained in terms of factors affecting cyclone efficiency.

Range factors include but are not limited to – air to powder ratio, cyclone diameter, particle size, critical particle size, condition of cyclone, base leakage of cyclone.

4.4 The operating principles of centrifugal dust cyclones are explained in terms of mechanisms for powder discharge from cyclones and their mode of operation.

Range mechanisms include but are not limited to – rotary valves, venturis, cycle valves, vortex breakers.

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Outcome 5

Explain the methods and principles of the standardisation of milk composition in a dairy processing operation.

Performance criteria

5.1 Methods of standardisation are explained in terms of the process steps involved and their relative advantages in relation to process flexibility.

Range methods of standardisation include but are not limited to – batch, direct in-line.

5.2 The principles for calculation of relative proportions for standardisation are explained in terms of the Pearson Square method or equivalent.

5.3 The principles of standardisation of milk composition are explained in terms of control variables and their influences on the accuracy and consistency of standardisation.

Range control variables include but are not limited to – fluctuations in fat content of incoming milk, fluctuations in throughput, fluctuations in preheating temperature.

5.4 Automatic standardisation of milk composition is explained in terms of control loop(s) required, means of measuring the controlled conditions and means for regulation of the manipulated variables.

Replacement information	This unit standard was replaced by unit standard 32930 and unit standard 32932.

This unit standard is expiring. Assessment against the standard must take place by the last date for assessment set out below.

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Status information and last date for assessment for superseded versions

Process	Version	Date	Last Date for Assessment
Registration	1	10 January 1994	31 December 2014
Revision	2	16 September 1997	31 December 2014
Review	3	5 July 1999	31 December 2014
Revision	4	13 June 2003	31 December 2014
Rollover and Revision	5	20 June 2006	31 December 2014
Rollover	6	17 July 2009	31 December 2016
Review	7	18 June 2015	31 December 2024
Review	8	28 April 2022	31 December 2024

Consent and Moderation Requirements (CMR) reference	0022

This CMR can be accessed at http://www.nzqa.govt.nz/framework/search/index.do.

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