Title	**Describe the design and operating principles of centrifugal separators used in a dairy processing operation**		
Level	**5**	**Credits**	**15**

Purpose	People credited with this unit standard are able to describe: the principles of continuous disk bowl centrifugal separation; the design and modes of operation of centrifugal disk bowl separators; and the operating principles of centrifugal decanters and cyclones, in a dairy processing operation.

Classification	Dairy Processing > Milk Processing

Available grade	Achieved

Guidance Information

1 Legislation and regulations relevant to this unit standard include but are not limited to:
- Animal Products Act 1999;
- Health and Safety at Work Act 2015;
- Animal Products (Dairy) Regulations 2005;
and any subsequent amendments.

2 Definition
Separation refers to mechanical separation by centrifugal force.

Outcomes and performance criteria

Outcome 1

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

Performance criteria

1.1 Describe continuous disk bowl centrifugal separation of solid particles 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.

1.2 Describe continuous disk bowl centrifugal separation of milk 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.

1.3 Describe disk bowl centrifugal separation of milk in terms of the importance of skimming efficiency in relation to the expected end use of the separated fractions.

Range end use may include but is not limited to – standardised milk, skim milk for casein, skim milk powder, membrane processing of casein whey;
evidence of one end use is required.

1.4 Describe continuous disk bowl centrifugal separation of milk in terms of factors affecting skimming efficiency and control of the fat content of cream.

Range factors may 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;
evidence of six factors is required.

Outcome 2

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

Performance criteria

2.1 Describe the design of centrifugal disk bowl separators 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.

2.2 Describe the design and modes of operation of centrifugal disk bowl separators 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.

2.3 Describe modes of operation of centrifugal disk bowl separators in terms of differences between semi-open and hermetic separators in the means of controlling the fat test of cream leaving the separator.

2.4 Describe design and modes of operation of centrifugal disk bowl separators in terms of configurations for separation, clarification and mechanisms for continuous desludging.

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

2.5 Describe design and modes of operation of centrifugal disk bowl separators in terms of configurations for functions other than skim milk and/or cream separations.

Range functions may include but are not limited to – cream concentration, clarification (phase-inversion and separation), bactofugation, dense phase concentration;
evidence of three functions is required.

2.6 Describe the operation of centrifugal disk bowl separators in terms of operating problems, their likely causes and remedies.

Range 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 of four operating problems is required.

2.7 Describe the operation of centrifugal disk bowl separators in terms of safety precautions that must be followed during the operating routine and the reasons for them.

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

Outcome 3

Describe the operating principles of centrifugal decanters and cyclones in a dairy processing operation.

Performance criteria

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

3.2 Describe the operating principles of centrifugal cyclones in terms of their fixed-housing and tangential entry configuration, and separation pathways.

Range operating principles may include but are not limited to – separation of milk concentrate from vapour, separation of dust particles from air;
evidence of one operating principle is required.

3.3 Describe the operating principles of centrifugal dust cyclones in terms of factors affecting cyclone efficiency.

Range factors may include but are not limited to – air to powder ratio, cyclone diameter, particle size, critical particle size, condition of cyclone, base leakage of cyclone;
evidence of three factors is required.

3.4 Describe the operating principles of centrifugal dust cyclones in terms of mechanisms for powder discharge from cyclones and their mode of operation.

Range mechanisms may include but are not limited to – rotary valves, venturis, cycle valves, vortex breakers;
evidence of two mechanisms is required.

Replacement information	This unit standard and unit standard 32934 replaced unit standard 764.

Planned review date	31 December 2026

Status information and last date for assessment for superseded versions

Process	Version	Date	Last Date for Assessment
Registration	1	28 April 2022	N/A

Consent and Moderation Requirements (CMR) reference	0022

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

Comments on this unit standard

Please contact Hanga-Aro-Rau Manufacturing, Engineering and Logistics Workforce Development Council qualifications@hangaarorau.nz if you wish to suggest changes to the content of this unit standard.