Title	**Demonstrate knowledge of rheology and calculate output from processing equipment for polymer compounds**		
Level	**5**	**Credits**	**6**

Purpose	People credited with this unit standard are able to describe the melt flow characteristics of polymer compounds, and calculate the melt flow rate of a polymer compound from processing equipment.

Classification	Plastics Processing Technology > Plastics Materials

Available grade	Achieved
Recommended skills and knowledge	Competence in the transposition of formulae, the manipulation of equations, and the use of trigonometric functions; and have an understanding of fundamental concepts of physics (mass, length, and time) and derived concepts including pressure, force, gravitational effect, velocity, acceleration, and energy.

Explanatory notes

Definition
Polymer compounds – mixtures of common polymers and additives. Common polymers are polyolefins, styrenics and vinyls.

Outcomes and evidence requirements

Outcome 1

Describe the melt flow characteristics of polymer compounds.

Evidence requirements

1.1 Shear and shear rate are described in relation to polymer compounds.

1.2 Newtonian and forms of non-Newtonian flow are distinguished.

Range forms – pseudoplastic, dilatant.

1.3 The influence of the characteristics of polymers on flow is described.

Range characteristics – molecular structure, molecular weight, molecular weight distribution, additives;
evidence is required for two characteristics is required.

1.4 The processing conditions which influence flow are described, and examples are given for extrusion and injection moulding.

Range processing conditions – melt temperature, shear, shear rate, pressure;
examples – processing equipment and moulds or dies;
evidence is required for one example of either extrusion or injection moulding and all processing conditions.

Outcome 2

Calculate the melt flow rate of a polymer compound from processing equipment.

Evidence requirements

2.1 The output equation for an extruder screw is interpreted and the dimensional data for the screw is related to the equation.

2.2 The output from an extruder is calculated using viscosity and shear rate diagrams, and the effects of screw wear are quantified.

Range output – mass flow rate.

2.3 The mean velocity, viscosity, shear rate and output of a polymer compound are calculated at critical points in the extrusion and injection moulding processes.

Range extrusion critical points – extruder screws, slit dies, annulus dies;
injection moulding critical points – hot and cold runners, straight and curved flow channels;
evidence is required for one critical point in either extrusion or injection moulding.

2.4 The characteristic curves for an extruder screw and die are calculated, and the resultant operating point for the system is established.

Planned review date	31 December 2021

Status information and last date for assessment for superseded versions

Process	Version	Date	Last Date for Assessment
Registration	1	27 May 2002	31 December 2019
Rollover and Revision	2	25 September 2006	31 December 2019
Review	3	11 December 2009	31 December 2019
Review	4	15 September 2016	N/A

Consent and Moderation Requirements (CMR) reference	0013

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

Please note
Providers must be granted consent to assess against standards (accredited) by NZQA, before they can report credits from assessment against unit standards or deliver courses of study leading to that assessment.

Industry Training Organisations must be granted consent to assess against standards by NZQA before they can register credits from assessment against unit standards.

Providers and Industry Training Organisations, which have been granted consent and which are assessing against unit standards must engage with the moderation system that applies to those standards.

Requirements for consent to assess and an outline of the moderation system that applies to this standard are outlined in the Consent and Moderation Requirements (CMR). The CMR also includes useful information about special requirements for organisations wishing to develop education and training programmes, such as minimum qualifications for tutors and assessors, and special resource requirements.

Comments on this unit standard

Please contact Competenz qualifications@competenz.org.nz if you wish to suggest changes to the content of this unit standard.