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Polymer Technology Apprenticeship
Ibec

Employer Handbook

Bachelor of Science (Level 7) in Polymer Processing Technology

(Apprentice Mode)

ENGINEERING

TUS

SOLAS learning works | An Roinn Oideachais agus Scileanna Department of Education and Skills | HEA HIGHER EDUCATION AUTHORITY AN ÚDARÁS um ARD-OIDEACHAS | QQI Quality and Qualifications Ireland Dearbhú Cáilíochta agus Cáilíochtaí Éireann

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Foreword

The Irish polymer sector continues to evolve as one of Ireland's premier manufacturing and technology industries. The industry has developed beyond recognition over the last ten years to become a world class provider of the most advanced polymer solutions.

A central priority for Polymer Technology Ireland has always been the development of skills in the industry. PTI is the initiator and manager of the Polymer Processing Technologist Apprenticeship that is delivered in conjunction with Athlone Institute of Technology. The Apprenticeship is geared towards providing the polymer industry with an attractive long-term career path for existing and new employees who can become apprentices in the knowledge that they will work towards a Level Seven qualification and a rewarding career in polymers. With a growing industry and extremely strong demand for skilled people, the apprenticeship will play an important role in attracting the highest calibre of young people into the polymer sector – this is fundamental to the future development of our industry.

I want to see the apprenticeship grow and develop as more companies embrace the pipeline of high-level skills that it can deliver. Participating companies are in the best position to identify employees who are a good fit for the apprenticeship or, indeed, recruit new employees with the apprenticeship in mind. The apprenticeship model is ideal for a range of people who wish to create a high value-add career in the polymer industry and make a contribution to the success of our sector.

Polymer Technology Ireland will continue to be the voice of the sector in Ireland. We will work with our colleagues in Ibec to deliver a high-quality environment where businesses can grow and prosper. Skills, training and workforce development remains a core element of what we do.

Mark McAuley
Director, Polymer Technology Ireland

Introduction

The Polymer Technology Apprenticeship was developed by Polymer Technology Ireland to meet the needs of the Polymer sector ranging from polymer technology, medtech, biopharma & engineering to meet the needs of businesses both large and small. These earn and learn programmes combine on-the-job learning and academic education with Athlone Institute of Technology as the lead provider.

The Polymer Technology Apprenticeship is an excellent way for companies to upskill talent with business using the apprenticeship programme to help both new hires and existing staff achieve their career goals.

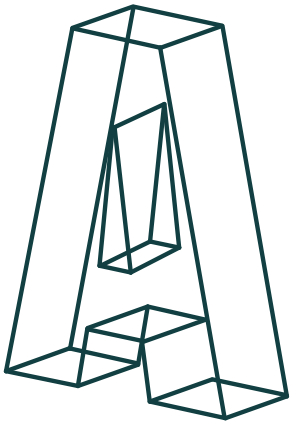
With no upper age limit to entry onto the programme it provides a structured way towards acquiring a Level 7 qualification with the possibility to continue on to Level 10. The apprenticeship covers a broad range of polymer processing activities including Injection Moulding, Blow Moulding and Extrusion. The apprentices earn while learning and gain a national qualification with which they achieve an excellent career route. Through their study towards professional qualifications and the application of these learnings in the company, apprentices are building their technical knowledge which in turn feeds back into the business.

The feedback from companies engaged to date has been exceptional, and this apprenticeship is viewed as a route towards a wide and diverse career choice in the future with qualified apprentices having opportunities to progress upwards in their companies from engineering level to more senior positions.

I would encourage companies to consider this apprenticeship as a route towards growing your own well-managed talent pipeline as the long-term benefits far outweigh the initial company investment.

Trish Breen
Ibec Medtech and Polymer Apprenticeships Project Manager

What is an Apprenticeship?



An apprenticeship is a programme of structured education and learning which formally combines and alternates learning in the workplace with learning in a third-level education institution or training centre. E.g. Athlone Institute of Technology for the Polymer Apprenticeship.

It is a dual system, a blended combination of on-the-job employer-based learning and off-the-job learning.

The emphasis is on learning engineering problem-solving skills with an emphasis on polymer technology and/or the ways in which engineers and technicians go from problem to solution. In the workplace, Industry Mentors help apprentices to observe and engage in problem-solving. Mentors demonstrate their own problem-solving approaches to apprentices, provide coaching and a learning structure. The apprentices then, through describing their own reasoning and reflecting on their own problem-solving methods (e.g. by comparing them to those of the Industry Mentor or other engineer), develop deeper understanding of this cognitive process. They enhance their problem-solving skills and develop new approaches, increasingly operating under their own initiative.

The learning process also helps to develop the common traits of technologists, for example, the ability to collaborate and communicate, an optimistic outlook, curiosity, resourcefulness, open-minded, rigor, resilience and mindfulness of ethical considerations. The cognitive apprentice further seeks to foster the “problem-solving mind-set”, which includes, for example, creative problem-solving, a relentless drive for improvement, systems thinking, visualisation and adaptation.

Key features of this cognitive Apprenticeship:

- Industry-led by a consortium of industry and academic partners
- Leads to an award at Level 7 on the National Framework of Qualifications (NFQ)
- Three years in duration
- Minimum 50% on-the-job learning
- Apprentices are employed under a formal contract of apprenticeship
- The employer pays the apprentice for the duration of the apprenticeship
- Minimum entry age limit but no upper age limit

About the Apprenticeship

The purpose of this programme is to provide high quality polymer processing technologists to support the local and national polymer industries (particularly in highly regulated industries) and to provide opportunity to prospective students to acquire rewarding and progressive careers.

Apprenticeship programmes combine on-the-job learning and academic off-the-job education for those entering the workforce. Apprenticeship programmes are also identified as sandwich programmes or dual education programmes.

Apprenticeship differs from internship in that: apprentices are paid employees; salary may increase as the apprentice completes parts of the programme; the time spend on the job is much longer; and the apprentices are generally guaranteed a job at the end of their studies (although this is not part of the apprentice contract).

These programmes offer unique benefits and advantages for companies and apprentices. The apprentices earn while learning and gain a national qualification with which they achieve an excellent career route. The employers can tailor the programmes and their participation in the programmes, address skill shortages, improve staff retention and avail of government training subsidies.

It is often assumed that apprenticeship is an easier form of education and learning, but the workload can be very heavy on the students. The sandwich or alternate education structure offers the advantage over full-time study modes by providing curriculum contextualisation that strengthens student commitment, motivation and conviction, which in turn strengthen student learning. Indeed, the apprentice must achieve the same programme outcomes as a full-time student with less formal class contact time. To limit the student's potential difficulties, it is essential that a robust selection process is used by employers for apprentice recruitment.

On completion of this programme, the students will be awarded a **Bachelor of Science in Polymer Processing Technology**.

Apprenticeship Structure

	Bachelor of Science in Polymer Processing Technology
Duration	3 years
Award Level	Level 7
Duration of Academic Blocks	15 weeks per year
Duration of Industry Blocks	37 weeks Industry Block 1 37 weeks Industry Block 2 37 weeks Industry Block 3
Programme status (FT/PT)	Full Time
Location of Academic Block delivery	Athlone Institute of Technology
Number of Apprentices per class	Maximum of 16
Entry requirements	Industry interview SOLAS apprentice approval Pass (Grade O6 or better) in five Leaving Certificate subjects. Two of these subjects must be Maths and a language (English or Irish) ***Mature students (over 23yrs) exempt from needing the Leaving Certificate***

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Academic Partner

AIT has been involved in apprenticeship training and Polymer Engineering for decades and are committed to providing learners with work-ready skills coupled to a strong theoretical foundation that ensures their long-term career success. AIT has been a designated centre of plastics education in Ireland since 1971 supplying graduates to the growing plastics industry.

The institute has invested heavily in infrastructure, education and research facilities and is the National centre of excellence for polymer technology. It boasts state-of-the-art facilities for polymer processing and polymer physics in a €36m purpose-built Engineering and Informatics building with world class industry focussed research carried out in our Applied Polymer Technologies gateway. We are incredibly proud to be the academic provider of the Polymer Technology Apprenticeship supporting the polymer industry. The graduates have benefitted hugely from a fantastic mix of applied, on the job learning and training in our cutting-edge laboratories as well as the input of lecturers, industrial mentors and the support of their fellow apprentices. This apprenticeship program underpins the personal development of our learners and prepares them for a hugely rewarding career in the polymer sector and would not be possible without the exceptional support we receive from IBEC, industry partners and apprentice employers.

Breda Lynch,
Head of Department,
Polymer, Mechanical & Design –
Athlone Institute of Technology

Testimonials

Company Testimonials

Getting involved in an industry led apprenticeship in the area of polymer processing technology for us was a no brainer. Through the Polymer Technology Apprenticeship programme we will have employees who are not only trained to industry standards in the area of polymer processing technology but who understand our unique workplace requirements".

Aisling Nolan, General Manager, Mergon and Chairperson of the Polymer Apprenticeship Consortium

The Polymer Technology Apprenticeship programme has been a valued addition to our talent development strategy in West. Medical Device manufacturing is a fast paced & expanding sector where the demand for technical skills has been intensifying for many years. This programme was designed by the industry to meet the specific skills required in the polymer industry which means it allows us to develop employees to our exacting requirements. It has enabled West to offer a career path for existing employees in the engineering field whilst also creating a stable pipeline of skilled Technicians in an area where the business struggled to recruit.

Ann Clarkin, HR Business Partner, West Pharmaceuticals

Mentor Testimonial

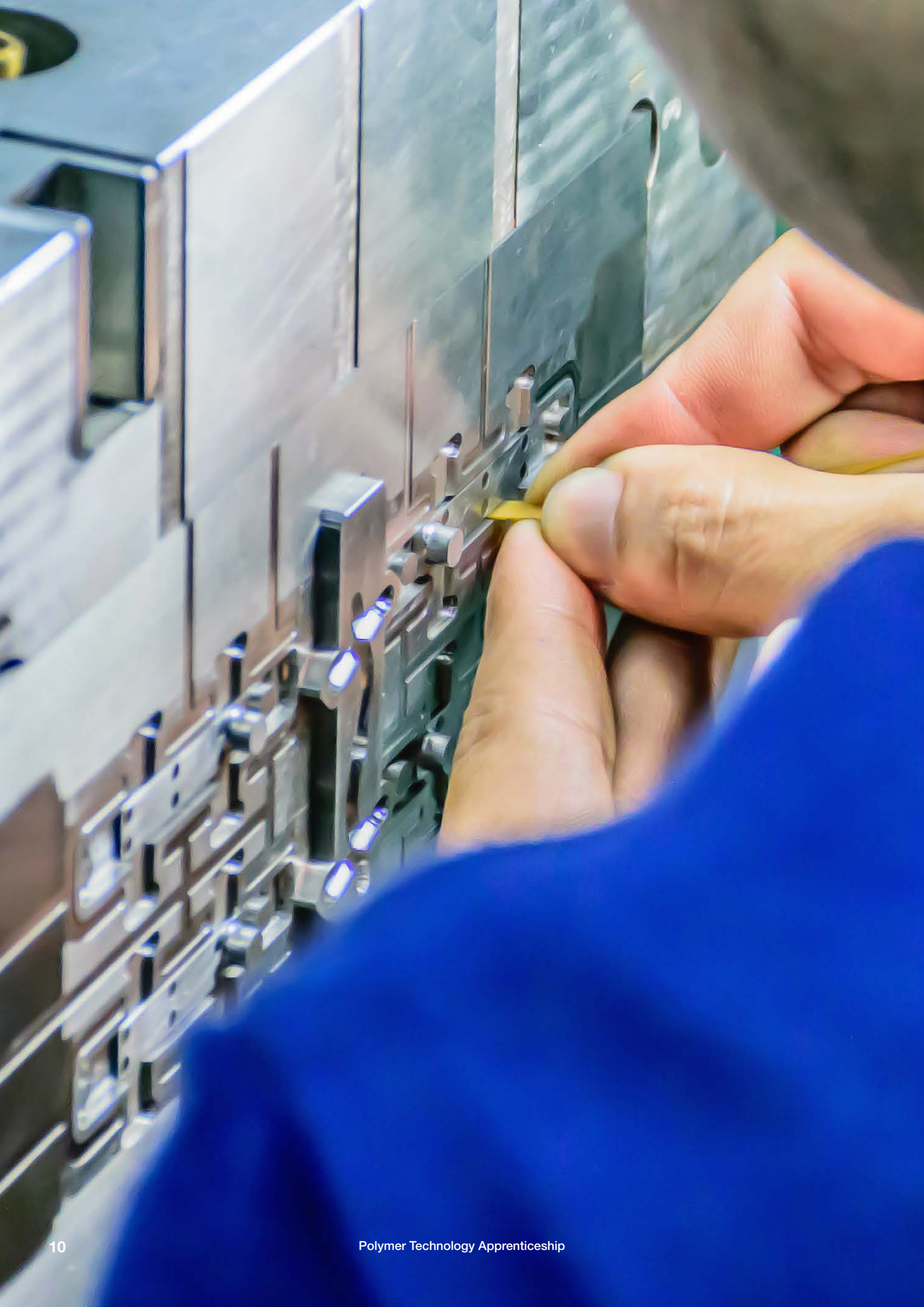
It has been great to be a part of the polymer apprenticeship programme as it gives structured training with set goals for the apprentice and the mentor to target together. The programme combines skills learnt during the academic block with practical on the job training. I have enjoyed the mentoring process and have built a good relationship with the apprentice and academic supervisors in AIT. This programme workload and learnings are challenging for the apprentice, but with support of company and AIT, industry can create skilled Technicians and Engineers.

Paul Boud, Mentor and Process Engineer, Jabil Healthcare

Apprentice Testimonial

The apprenticeship in polymer processing technologies was a great experience for me. As the apprenticeship is broken into on the job and academic blocks you have an opportunity to learn a wide range of skills from the college modules and put them into practice when you return to work. The topics covered in AIT, both theory and practical, were extremely relevant to myself working in an injection moulding manufacturing background enabling me to further my skillset. Already the course has boosted my career in a positive direction giving me a wealth of experience and a well-recognised 3rd level qualification in the industry.

Dean Thompson, Apprentice, BD Medical



Who is the Apprenticeship for?

Apprentice

The minimum entry requirement for the programme are as follows:

School leaver applicants

The minimum Leaving Certificate requirements for entry into the proposed programmes is a pass (Grade O6/H7 or better) in five Leaving Certificate subjects or equivalent. Two of these subjects must be Maths and a language (English or Irish).

Current (pre-2017) Leaving Certificate Grading Scale	New Leaving Certificate Grading Scale	New points at Higher Level	New points at Ordinary Level
A1	**H1 / O1**	100	56
A2	**H2 / O2**	88	46
B2			
B2	**H3 / O3**	77	37
B3			
C1	**H4 / O4**	66	28
C2			
C3	**H5 / O5**	56	20
D1			
D2	**H6 / O6**	46	12
D3			
E		33	0

Mature applicants

Mature applicants do not have to meet the Leaving Certificate entry requirements for the programmes, and they are assessed based upon their previous education and work experience pending a demonstration of their ability and competence to undertake the programme.

Employer

The Polymer Apprenticeship is open to all companies manufacturing polymer related components within Ireland. The company must have a manufacturing process which allows the apprentice to achieve all the learning outcomes set out in the occupational profile. A SOLAS Authorised Officer will conduct an on-site 'suitability to train' visit with the employer.

Apprenticeship Schedule

The apprentice will spend 15 weeks/calendar year in Athlone Institute of Technology completing their academic block, and the remaining 37 weeks/calendar year in the company completing their on-the-job training.

There are two **possible** schedules for the Polymer Processing Apprenticeship. A summer intake **and/or** an autumn intake. A decision will be made by the consortium on how many intakes there will be in any given year. This decision will be based solely on demand from industry and the availability of the academic provider.

Option 1: Summer Intake

Jan	Feb	Mar	Apr	May	June	July	Aug	Sep	Oct	Nov	Dec
				Industry 1				Academic Block 1 in AIT			
Industry 2								Academic Block 2 in AIT			
Industry 3								Academic Block 3 in AIT			
Industry 4											

Option 2: Autumn Intake

Jan	Feb	Mar	Apr	May	June	July	Aug	Sep	Oct	Nov	Dec
								Industry 1			
Academic Block 1 in AIT				Industry 2							
Academic Block 2 in AIT				Industry 3							
Academic Block 3 in AIT				Industry 4							

Registering your Company

Firstly, the company must get approved to train apprentices. To do this they must demonstrate that they have the capacity and the ability to provide quality, relevant on-the-job training to apprentices as per the requirements of the national Apprenticeship programme and the statutory Apprenticeship system overall. Employers must allow the Apprentice to attend all classroom / online learning days and these days count as workdays.

To gain approval, an Authorised Officer (AO) from the employer's local Education and Training Board (ETB) carries out a site visit where the employer is formally assessed (e.g. apprentices employed in Limerick region will be assessed by an AO from Limerick Clare ETB). It is important that Industry Mentors and apprentices show the AO that they are very familiar with the programme and understand their own roles and responsibilities. The AO makes a recommendation to SOLAS on the employer's suitability to deliver the programme. We provide the AO with the contact details of all Industry Mentors and then the AO will then make contact with the company to carry out a visit.

Registering your Company continued

To gain approval the company must do the following:

1. Populate a 'Company Commitment form', return to info@polymertechnologyapprenticeships.ie **(Company Commitment Form, see Appendix A)** OR Contact your local ETB office.

2. The assigned SOLAS Authorise Officer will conduct a site visit to assess the company's suitability to train.

3. The company must have the Apprentice and Mentor selected prior to the commencement of apprenticeship.

4. The company must appoint a Mentor for the apprentice **(Mentor Registration Form, see Appendix B)** which includes details of the Mentor's academic qualifications.

5. Apprentices must register with the academic provider and submit their associated GDPR form (AIT or Apprenticeship Manager to facilitate).

Please have the following information ready for the AO visit:

Industry Mentor Details (Level 7 programme)

1. Mentor Name and Contact details (Phone and Email)
2. Copy of a Level 7 qualification in a cognitive discipline with at least two years additional experience in a polymer-based role. If the Industry Mentor does not have a Level 7 qualification, he/ she will need a letter from the Employer (signed and on headed paper) confirming they have the relevant industry experience to support the apprentice for the on-the-job learning, (minimum of 2 years relevant industry experience in a polymer-based role).

Apprentice Details

1. Apprentice name and contact details (home and work address, email and phone)
2. Qualification Certificates (e.g. Leaving Certificate)
3. Letter from employer if required (e.g. if the Apprentice does not have a Level 5 qualification, they need a letter on headed paper, confirming they have a minimum 3 years work experience)
4. Two Passport ID Photos (signed by Apprentice)
5. Photocopy of Personal Identification (e.g. Passport or Driving License) clearly showing all details
6. Apprentice PPS number

Employer Details

1. Employer Tax Number
2. Number of employees employed in branch
3. Date Trading commenced

How to get involved

Step 1: Preparation

- Contact the Polymer Apprenticeship team on 01 605 1727 to discuss the programme.
- Complete the company commitment form and send via email to: **info@polymertechnologyapprenticeships.ie**
- Decide on suitable apprentice role and how many apprentices you will recruit.

Step 2: Process

- Identify suitable employees to act as mentors to the apprentices. Mentors will be provided with training.
- Ensure that you are able to release the apprentice for 15-week block for academic training.
- Ensure that you can give the apprentice access to relevant systems and processes to support the learning outcomes.
- Sponsors and mentors will familiarise themselves with the SOLAS code of practice, the learning objectives of the programme, as well as the responsibilities of taking on an apprentice.
- SOLAS conducts a site visit to confirm the company is capable of facilitating an apprentice.
- Begin recruitment process.

Step 3: Recruitment

- Each company conducts their own recruitment process, it is important for you to find the right candidate.
- Marketing materials and support will be provided by Polymer Apprenticeship team.
- Companies can advertise for free their new hire apprentice positions on Solas website. E-mail : **info-apprenticeshipjobs@solas.ie**
- Shortlist candidates and begin interview process.
- Once you have selected your apprentices, their details will be given to SOLAS, Ibec and the academic provider.
- The apprentices will begin the Industry block and following this, they will commence their academic cycle. *(The starting date for intakes will depend on demand from industry and academic provider availability).* For programme starting in May, apprentice will begin the industry block in May and academic cycle will start in September / if starting industry block in September, academic cycle will begin the following January.
- The Polymer Apprenticeship team will provide continuous support to both industry and apprentices throughout the course of the programme.

Apprenticeship Stakeholders

Apprenticeship is a national programme which is managed and delivered by a number of education partners, Government bodies, the Department of Education and Skills, employers and unions.

1. **SOLAS** has statutory responsibility for the designation of apprenticeships as part of the statutory apprenticeship system, which is organised in Ireland by SOLAS, the Department of Education and Skills, the Higher Education Authority, employers and unions.

2. **Employers** are responsible for the employment of an apprentice and for the delivery and facilitation of the Industry-Block learning elements of an apprenticeship, including supporting Industry Mentors and development of Learning Plans.

   The employer must:

   (a) Ensure the apprentice is released to attend induction presentation and 'off the job' blocks.

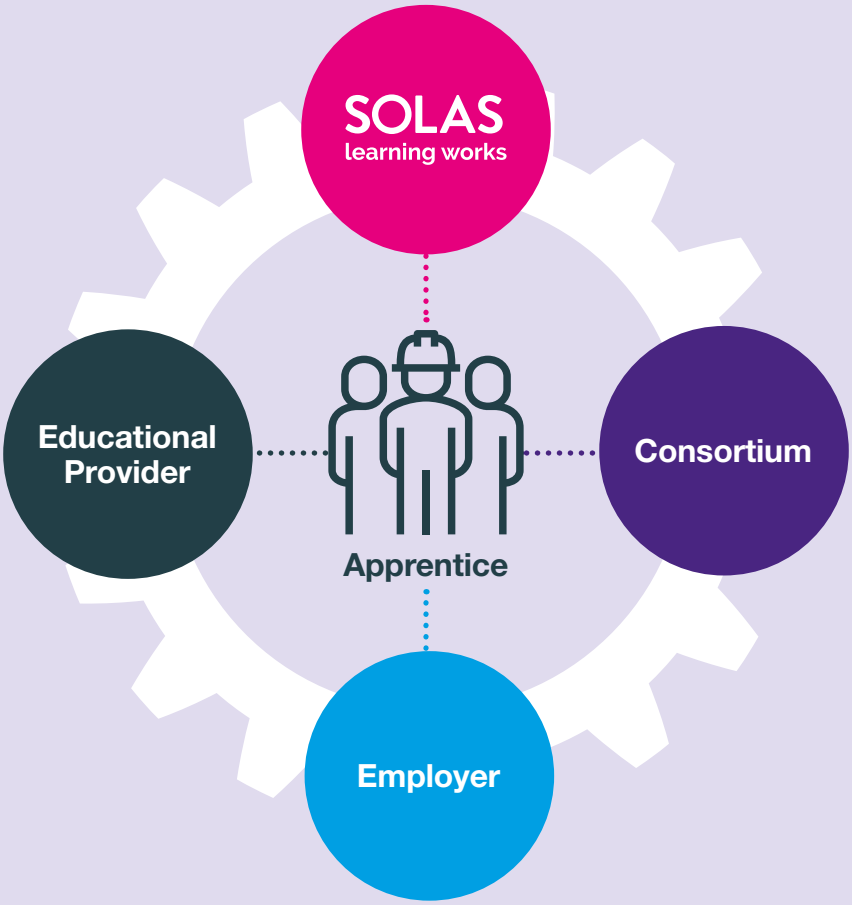
   (b) Provide access for the apprentice to the appropriate equipment and resources to complete the 'on the job' elements of the programme.

   (c) Assign a person qualified in the occupation to act as a mentor to the apprentice for 'on the job' elements.

   NOTE: A registration fee, per apprentices per year, must be paid to the academic provider. This can be paid by either the company or the apprentice. This should be agreed locally.

3. **The Academic Provider** is responsible for the delivery of the learning and education elements of an apprenticeship.

4. **The Apprenticeship Consortium** is made up of representatives from industry, the academic providers, SOLAS representatives and the apprenticeship team.



Key roles and responsibilities

Title	Role
Apprenticeship Manager	• Manages the apprenticeship programme
Academic Partner	• Delivers the off-the-job / College-Based blocks
Academic Supervisor	• Visits each apprentice in their workplace • Supports the apprentice in the workplace (Industry Module activities) • Support for Industry Mentor
Industry Mentor	• Mentors, facilitates & guides apprentices at work • Develops apprentice Learning Plan • Meets weekly with apprentice and reviews weekly Reflective Logbooks • Meets with the Academic Supervisor when he/she visits. • Attends 1-day training organised by the Apprenticeship Manager
Company Sponsor	• Point of contact in the company
External Examiner	• Reviews a sample of assessments

The role of the Industry Mentor

An Industry Mentor (IM) is an experienced person, qualified in the occupation, who will guide and support the apprentice whilst they are completing their 'On-the-job' learning. They will also develop a Learning Plan for the apprentice.

The Industry Mentor will be a technical role model, who will demonstrate the use of technical skills and problem-solving at technologist level, as appropriate. He or she will ensure that the apprentice performs polymer processing work to the highest standard – with accuracy, rigor, discipline, and due care. The importance of an ethical approach to polymer processing work will also be a core theme of the learning.

The Industry Mentor will help the apprentice to become an effective contributor to the organisation. This will involve understanding "how things get done around here" - who they need to talk to, and how they need to approach them, as well as "the big picture" – how all the departments work together to service customers. It is the Mentors responsibility to guide the apprentice through the on-the-job learnings they are expected to complete as part of this apprenticeship. For specific assessments, which will be marked by the academics, the Industry Mentor may offer guidance to the apprentice on how to approach problems but will not complete the tasks for them.

Mentor requirements:
The Industry Mentor should have a minimum of a level 7 qualification in a cognate discipline and have a minimum of 2 years' post qualification experience in a polymer-based role.

Mentor Training

Each Industry Mentor will receive the following training:

- Mentoring Training: Apprenticeship Consortium
- Introduction to Apprenticeship Programmes and Mentor responsibilities: Academic Provider

As part of this training provided by the consortium, the Industry Mentor will learn how to support the apprentice in his or her learning.

For example, they will learn how to ask and answer questions as a mentor. How a mentor asks these questions can help to develop the “way of thinking” for the technologist. An example of this is asking open ended questions which helps the mentee to figure out solutions for themselves and to “think outside the box”.

Specifically, the training workshop will help the mentor to:

- Gain an in-depth knowledge of the polymer apprenticeship.
- Understand the structure of a professional mentoring session, including how to interact with the apprentices and progress relationships appropriately.
- Gain expertise in the techniques of mentoring.
- Understand how to work with a number of mentoring tools.
- Understand the ‘on the job’ elements that the apprentice will complete while based in industry.
- Understand the apprentice assessment and evidence -based capturing processes.
- Prepare a Development Plan for their mentee.

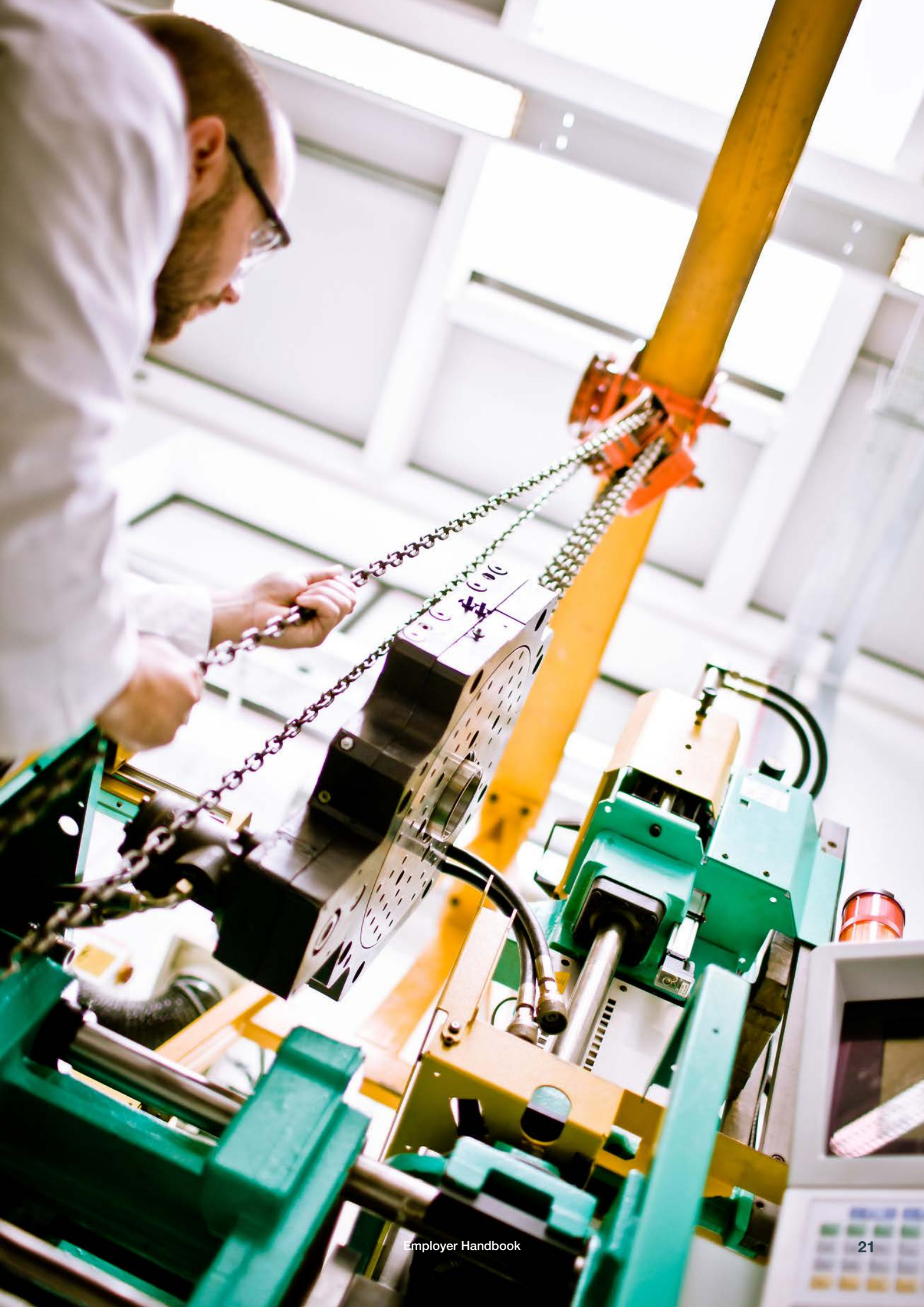
The Industry Mentors will have access to information for their apprentice’s assessments, deadlines and performance.

The role of the Academic Supervisor

Every apprentice will be assigned an Academic Supervisor from the academic provider to support the apprentice through their experiential learning. The Academic Supervisor is responsible for the Industry Module assessments. The Academic Supervisor is the primary contact in college for the Industry Mentor, and for the apprentices in following their progress throughout the apprenticeship.

There will be at least one visit by the academic supervisor to the apprentice in the company. If an on-site visit cannot be facilitated, then it can be carried out via an online meeting.

Academics will interact with the apprentice during their Industry Blocks, primarily using an online learning platform (Moodle). This will allow for knowledge to be shared, course work, reports and evidence-based learning to be uploaded and reviewed, and feedback given. The Academic Supervisor will guide the apprentice through work-based learning exercises and review any material submitted.



Apprenticeship Objectives

Polymer Processing Technologist

On completion of this programme, the students will be awarded a Bachelor of Science Degree in Polymer Processing Technology.

They will be responsible for the efficient set up and operation of polymer processing lines in the fields of Injection Moulding, Blow Moulding or Extrusion Moulding for the production of plastic components whilst ensuring compliance with relevant industry standards.

The apprentice will have a strong technical aptitude for identifying and defining processing characteristics & parameters for a broad range of polymer materials; they will work cross-functionally with Production Team Leaders/Moulding Managers/Quality/Toolroom /Maintenance Department/ Material Suppliers & external customers to address machine, material, mould, die or tooling issues, including complex tooling assembly & breakdown.

The apprentice will have a working knowledge of the following polymer related areas:

- Polymer processing activities including Injection Moulding, Blow Moulding and Extrusion moulding.
- Polymer processing equipment including materials handling equipment, tooling, robotics, metrology, printing, post processing/packaging, automation, cleanroom equipment, 3D printing/additive manufacturing and labelling equipment.
- Plastics processing equipment including electrical systems, electro-mechanical, electro-pneumatic, electronic, temperature and pressure control systems, hydraulic/electrical and microprocessor based systems.
- Range of thermoplastic and thermoset polymers including their fields of application and processing characteristics.
- Read mould/die and part design drawings.
- Read process data and understand the proper use of test instruments- e.g., go/no go gauges, Vernier callipers, tensile, impact testing.
- Engineering principles – such as speeds, pressures, times in order to effectively troubleshoot the process for product optimisation.
- Mould design concepts including hot-runner system, core pulling, sliding cores/cavities (polymer processing machines, injection blow moulding and extrusion)

Programme Structure

The Teaching and Learning strategy of the Apprenticeship is based upon the principles of experiential and situated learning theories.

In practice, this offers the learner the opportunity to explore abstract and theoretical principles of their discipline through experimentation and meaningful engagement, whereby they are encouraged and required to reflect upon their experiences and learning to ensure deeper levels of knowledge and skills acquisition.

In his theory of Experiential learning, Kolb (1984) argued that learning is most effective when following the cycle presented in the figure below:

Academic Blocks

The content of the academic modules will be delivered using a variety of teaching and learning methods including:

- Lectures
- Tutorials
- Industrial Visits
- Practical Laboratory Sessions
- Case studies
- Computer Base Learning
- Online learning (Synchronous & Asynchronous)
- Project work

Lectures and tutorials (supported by online learning platforms) will be used to allow students to develop their knowledge and understanding of key polymer processing concepts. The laboratory/ workshop environment will provide the students with an environment within which he/she can reinforce theoretical learning in a practical academic setting. The apprentice will be encouraged to forge meaningful links between abstract theoretical content knowledge and the concrete hands-on experience of the practical and industrial environment.

Modules

There are four types of modules on the programme. Please see below:

1. **100% of assessment done during the Academic Block**
   These are modules that are either mainly dealing with engineering/scientific/mathematical principles that are best delivered in an academic setting, or where the consortium believes that it might be difficult to replicate the necessary learning equipment in each host company.

   The apprentice acquires this learning and completes all assessment before entering the workplace.

   The assessment strategy of these modules will be a combination of:

   - In-class/lab assessments such as tutorial sheets or online quizzes
   - Self-directed assessments such as lab reports, online quizzes and homework assignments
   - Exam type assessments at the end of the Academic Block

Each year will include up to three Type 1 modules. In general, these modules learning outcomes will be in the knowledge and skills categories.

2. **Online learning**
   Online lectures and tutorials will be delivered to accommodate the online learner, where he/she will have the option of logging on live or viewing the recorded lecture at a time which best suits their requirements. Each online module includes live lectures supplemented by lecture notes, reading material, group assignments, online discussion forums and quizzes.

3. Industry Modules: 100% of assessment done during the Industry Block
These modules have been designed to test the integration of the apprentices' learning across all modules and to evaluate their resultant contribution to the organisation.

This assessment strategy

- Completion of pre-defined tasks.
- Report and reflect upon these tasks in an e-portfolio submission.
- Industry Mentor approval through task checklist.

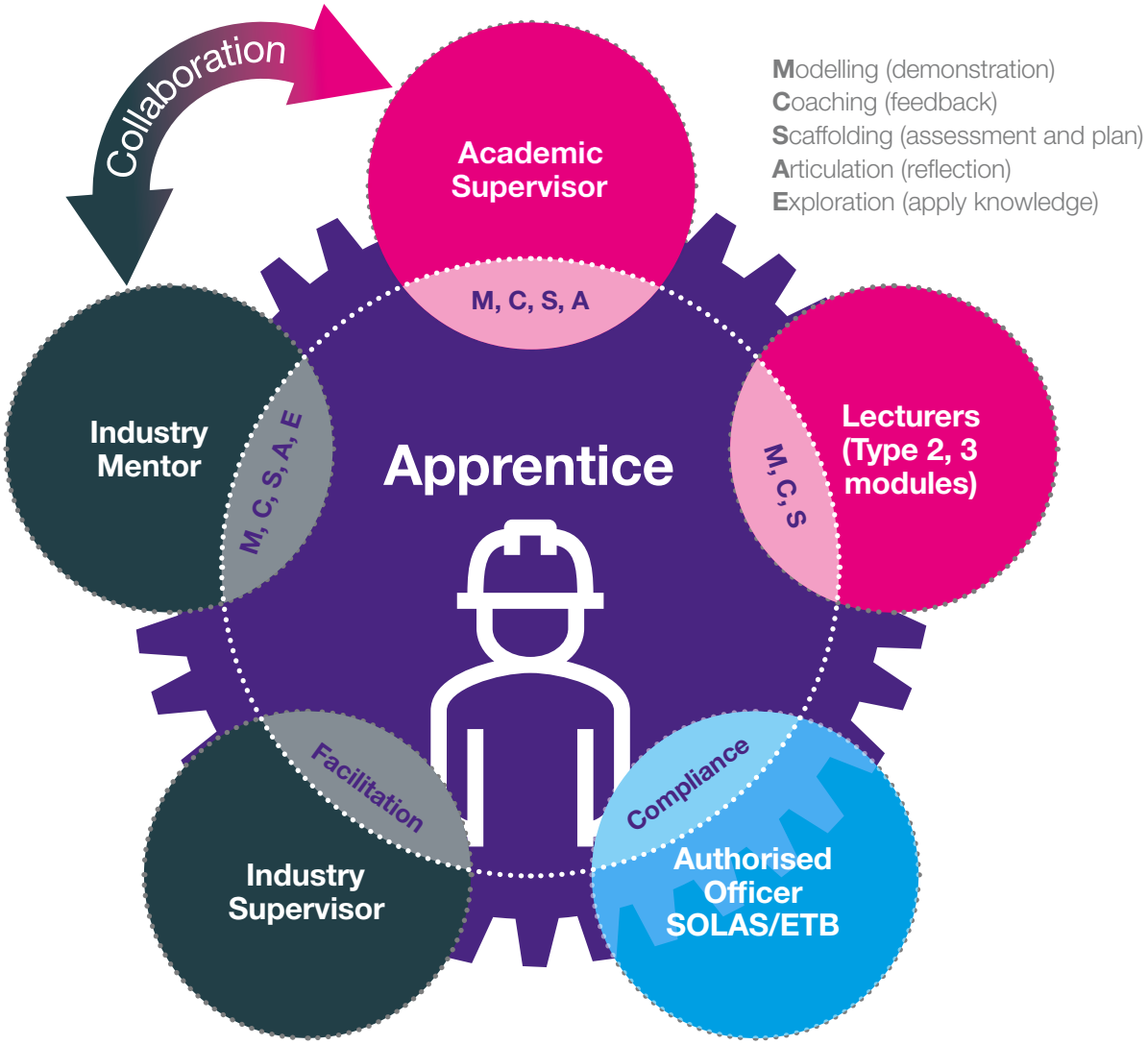
Year 1
On the Job Learning (Phase 1)
ICT and Learning to Learn
Polymer Processing (Phase 2)
Materials Science (Phase 2)
Electronics and Instrumentation (Phase 2)
Workshop Practice & Metrology 1 (Phase 2)
Maths for Engineering (Phase 2)
Core Science for Engineering (Phase 2)
On the Job Learning (Phase 3)
Engineering Drawing and CAD (Phase 3)
Good Manufacturing Practice (Phase 3)

Year 2
Automation and Control (Phase 4)
Polymer Science (Phase 4)
Mould Design and CAD (Phase 4)
Maths and Engineering Science (Phase 4)
Polymer Processing (Phase 4)
On the Job Learning (Phase 5)
Six Sigma 1 - Lean Sigma
Project Management (Phase 5)

Year 3
Automation and Control (Phase 6)
Process & Inspection Technology (Phase 6)
Polymer Materials (Phase 6)
Polymer Processing (Phase 6)
Phase 6 Project
On the Job Learning (Phase 7)
Phase 7 Project
Six Sigma 2 - Statistical Control

Industry Block

Despite the variability in potential roles in different companies, each apprentice will be given tasks and an environment that are appropriate to the kind of learning required to achieve a Level 7 award. The apprentice will be supported in this learning by their Industry Mentor, Industry Supervisor, Academic Supervisor, Academic Lecturers, and the SOLAS/ETB Authorised officer, as shown below.



The Polymer Technologist Apprenticeship is designed so that the apprentice completes seven distinct phases. Four of these phases (1, 3, 5, and 7) are spent in the workplace or, as it is termed, on-the-job. Students will complete these on-the-job phases in one of the following three polymer disciplines.

1. Injection Moulding
2. Blow Moulding
3. Extrusion

Assessment methods

In preparing the assessment strategy, the programme design team reflected again on Kolb's experiential learning cycle. The four stages of experiential learning are accommodated in each module of the programme. There is a need for students to develop their reflective skills as well as their ability to implement "active experimentation".

The four *on-the-job* phases form part of the seven-phase programme. The Assessments carried out during these phases are a subset of the overall assessment strategy. In these phases assessment will include practical demonstrations of acquired skills, on-line assignments and tests, Self-Evaluation Log-book and the completion of an E-Portfolio.

On-the-Job Check List

A comprehensive document has been produced, outlining the learning outcomes that the apprentice must achieve for him/her to pass each On-the-job phase. Learning outcomes are specified for each Phase and specific process Learning Outcomes are detailed for each polymer processing discipline as previously outlined. The learning outcomes have been designed in conjunction with academia and leading industry experts. Each learning outcome has a task associated with it and the apprentice has three attempts to complete the task. The Industry Mentor will assess these attempts on a continual basis. Should the apprentice fail on the job assessments three times, his/her case will be reviewed on an individual basis involving employer, and the Academic Supervisor. **Examples of these learning outcomes for Injection Moulding, Blow Moulding and Extrusion can be found in Appendix C, D & E.**

Self-Evaluation Log Book

The apprentice will create a logbook recording his/her experiences, and technical learnings during the On-the-Job phase. This logbook will then be assessed to (a) ascertain the quality of the apprentices work and (b) ascertain whether the apprentice has passed the phase.

E-Portfolio

The apprentice will upload evidence-based learnings to an on-line E-Portfolio e.g. Photographs, videos, documents etc. They will then act as tangible confirmation of the learning outcomes being reached.

Appendices

Appendix A

Company Commitment Form Polymer Apprenticeship

Date:

Company Name:

Company Location:

Key Point of Contact Details:

Name:

Job Title:

E-Mail:

Phone:

L7 Polymer Technologist Apprenticeship Programme:

How many people do you wish to enrol? ☐

Are your proposed apprentices existing or new staff (please tick)?

Existing ☐ New ☐

Please let us know where you heard about the apprenticeship programmes?

Can you provide your apprentices with the following?

Experienced **polymer** staff members to act as mentors (mandatory): Yes ☐ No ☐

In-company support during 16-week INITIAL Block (Induction and 3rd-Level Preparation): Yes ☐ No ☐

Release apprentices for 'off-the-job' training of 15-week/year for duration of programme: Yes ☐ No ☐

Apprentice Industry-Block Learning Plans, developed by the Mentors: Yes ☐ No ☐

Provide appropriate time/resources for Mentor support: Yes ☐ No ☐

Provide appropriate time/resources to the Apprentice to complete Academic work: Yes ☐ No ☐

Access to equipment/processes in **Injection, Extrusion** or **Blow Moulding**: Yes ☐ No ☐

Access to a range of polymer processing work for 'on the job' learning: Yes ☐ No ☐

Appendix B

INDUSTRIAL MENTOR FORM – Polymer Apprenticeship

MENTOR NAME:	
COMPANY NAME:	
COMPANY ADDRESS:	
CURRENT POSITION:	
MENTOR EMAIL ADDRESS:	
COMPANY SPONSOR:	
SPONSOR EMAIL ADDRESS:	

ACADEMIC AND/OR OTHER QUALIFICATIONS:

Title	College	Year

WORK EXPERIENCE:

Please include relevant duties and responsibilities, such as team leadership roles, previous tutoring/mentoring roles, etc.

Employer	Year	Position Held	Duties/Responsibilities

OTHER REQUIREMENTS:

	YES	NO
Are you willing to undertake a mentor training programme?		
Have you completed at least two years relevant work experience?		
Have you read *Book 3 – On-the-Job Learning* outlining the tasks and assessment criteria for the Polymer Processing Technology Apprenticeship?		
Have you read the Polymer Employer Handbook?		
If so, do you feel that you have the required experience to mentor and assess an apprentice in **one** of the three outlined polymer processing areas?		

OTHER RELEVANT INFORMATION:

SIGNED: **DATE:**

Please return by email to:

Email to: info@polymertechnologyapprenticeships.ie

Replacement Mentor Process

To ensure continuity of high-quality support to the apprentice, in the event of a change of Industry Mentor, it is important to ensure that replacement mentors go through the same formal process as initial mentors.

Mentor requirements:

The Industry Mentor should have a minimum of a level 7 qualification in a cognate discipline and have a minimum of 2 years' post qualification experience in a polymer-based role.

Steps to replace mentor:

1. Company Sponsor informs Ibec Project Manager, copying the academic provider of the upcoming change of Mentor (ideally 4 weeks' notice).
2. Company Sponsor identifies suitable replacement, who fills out the "INDUSTRIAL MENTOR FORM".
3. Company Sponsor sends the "INDUSTRIAL MENTOR FORM" to Ibec.
4. Ibec reviews the "INDUSTRIAL MENTOR FORM" and approves/rejects mentor.
5. Ibec informs the company of their recommendation.
6. Company sponsor informs the academic provider, and SOLAS Authorised Officer of the new approved mentor.
7. The Company Sponsor facilitates Mentor-Handover Training between outgoing and incoming Mentors.
8. New approved Mentor undergoes formal Ibec training.
9. New approved Mentor goes on the Ibec, academic provider and SOLAS databases.
10. New approved Mentor interacts with Academic Supervisor (associated with their apprentices) for overview of Programme-specific academic details, Student deliverables etc.

Appendix C

Injection Moulding – Learning Outcomes

Phase 1 - Injection Moulding

See Phase 1 titled On-The-Job

Note: The apprentice must undergo induction in accordance with standard company procedures.

A. Demonstrate and carry out relevant health and safety checks for the use of an injection moulding machine.

B. Demonstrate safe operation of lifting equipment, overhead crane, chain, hoist, shackles, eye bolts, slings etc. to install a mould.

C. Be able to identify and explain basic functions of an injection moulding machine and its operation.

D. Be able to identify and explain basic functions of a mould and the function of its individual parts.

E. Be able to describe the moulding cycle at a high level.

F. Demonstrate a strong Health & Safety awareness

G. Be able to safely start/purge/stop a moulding machine.

H. Be able to safely follow the correct shutdown procedure for a moulding machine and all ancillaries, purge the machine and dispose of purgings, in the required time.

Phase 3 – Injection Moulding

On-The-Job Assessments for Apprentices

A. Demonstrate the safe connection of cooling pipes and fittings to the mould prior to production.

B. Be able to describe the moulding cycle in detail and explain.

C. Be able to assemble and disassemble a mould.

D. Demonstrate the correct procedure to remove a mould.

E. Demonstrate the correct procedure to install a mould including setting of the moulds safety functions.

F. Identify and describe typical parameters and uses for a range of moulding materials.

G. Demonstrate correct manual handling techniques when handling moulding materials.

H. Demonstrate basic knowledge of technical drawings using a range of product, mould and machine drawings.

Phase 5 – Injection Moulding

On-The-Job Assessments for Apprentices.

Note on phase 5: The product selected for moulding is a low spec simple product and the apprentice will carry out these duties unassisted.

A. Set and operate several moulding machine, moulds and ancillary equipment as specified.

B. Demonstrate the ability to setup a moulding process from a baseline of no setting entered, to produce a turn-key low spec product using a predefined set of parameter settings.

C. Interpret the industry Code of Practice and carry out the subsequent operational inspection procedures drawing conclusions and initiating any remedial action.

D. (Regarding the area of fault finding) Demonstrate the ability to find and recognise moulding defects (aesthetic and dimensional) caused by incorrect machine conditions. They should then systematically identify the causes and apply corrective and preventative measures to ensure this problem does not reoccur.

E. Demonstrate the ability to remove the screw from the barrel of the moulding machine for routine maintenance.

Phase 7 – Injection Moulding

Final On-The-Job Assessments for Apprentices. All tasks to be carried out unassisted.

A. Prepare, plan and complete a full tool / mould change on a production machine to the point of start-up, without assistance and using safe working practice.

B. Select and set-up a robust Injection Moulding process to produce a high spec, turn-key product to specification using a production machine, without assistance and using safe working practice.

C. Set-up of all ancillary equipment associated with an injection moulding machine.

D. Evaluate a range (approx. 5) of polymer types and their working characteristics including the set-up, processing, fault finding of quality defects and the suitability of ancillary equipment associated with these polymers (company specific).

E. Complete a quality control assessment, yielding a successful product within specification.

Appendix D

Blow Moulding – Learning Outcomes

Phase 1 – Blow Moulding

On-The-Job Assessments for Apprentices.

Note: The apprentice must undergo induction in accordance with standard company procedures.

A. Demonstrate the operation of safety systems on a Blow Moulding Machine.

B. Demonstrate safe operation of lifting equipment, overhead cranes, chains, hoists, shackles, eye bolts, slings etc. to install a mould.

C. Identify and explain the basic functions of a Blow Moulding Machine and its operation.

D. Identify and explain basic functions of a mould and the function of its individual parts.

E. Describe the Blow Moulding process at a high level.

F. Demonstrate a strong Health & Safety awareness.

G. Demonstrate the ability to stop and start Blow Moulding Machine, to make it safe and purge the machine.

Phase 3 – Blow Moulding

On-The-Job Assessments for Apprentices

A. Demonstrate the safe connection of cooling pipes and fittings.

B. Demonstrate correct handling and cleaning of Blow Moulding tooling before operation.

C. Demonstrate correct procedure to install a die.

D. Identify and describe typical parameters and uses for a range of a Blow Moulding grade materials.

E. Demonstrate correct manual handling techniques when handling raw materials.

F. Demonstrate basic knowledge of technical drawings using a range of Product, die and machine drawings.

G. Describe the construction of an extrusion line to include various machine configurations – single screw, twin screw accumulator and continuous extrusion heads.

H. Assist in tooling changes and start-up including head strip, setting of machine hand over equipment.

Phase 5 – Blow Moulding

On–The-Job Assessments for Apprentices

A. Describe/demonstrate the effects on Blow Moulded component dimensions due to changes in process parameters such as air, screw speed, pressure, timers and temperatures.

B. Interpret the industry Code of Practice and carry out the subsequent operational inspection procedures drawing conclusions and initiating any remedial action.

C. (Regarding Troubleshooting) Demonstrate the ability to systematically identify the causes and apply corrective and preventative measures to ensure this problem does not reoccur. Describe Blow Moulding head and tooling assembly, use Parison Profile set up in correct assembly sequence with due consideration to tooling selection and adhering to tooling assembly procedure.

D. Describe Blow Moulding head and tooling assembly.

E. Describe the typical faults present as a result of various process parameters being applied.

F. Demonstrate the ability to fault find at a high level. Apprentice is Presented with a faulty product and must use the following equipment to fault find: callipers, go/no gauges, shadow graph, Magna-Mike etc.

Phase 7 – Blow Moulding

Final On-The-Job Assessments for Apprentices. All tasks to be carried out unassisted.

A. Prepare, plan and complete a full tool / mould change on a production machine to the point of start-up, without assistance and using safe working practice.

B. Select and set-up a robust Blow Moulding process to produce a high spec, turn-key product to specification using a production machine, without assistance and using safe working practice.

C. Set-up of all ancillary equipment associated with blow moulding machine.

D. Evaluate a range (approx. 5) of polymer types and their working characteristics including the set-up, processing, fault finding of quality defects and the suitability of ancillary equipment associated with these polymers (company specific).

E. Complete a quality control assessment, yielding a successful product within specification.

Appendix E

Extrusion – Learning Outcomes

Phase 1 – Extrusion

On-The-Job Assessments for Apprentices.

A. Demonstrate the operation of safety systems on an extruder.

B. Demonstrate safe operation of lifting equipment, chain, hoist, shackles, eye bolts, slings to install a die for larger set -ups.

C. Describe/demonstrate high level functions of various extruders, compounder and their operation *(See Fig 12.0, Fig 13.0 and Fig 14.0)*

D. Describe/demonstrate the extrusion process at a high level.

E. Demonstrate Health & Safety awareness in the workplace by completing the appropriate documentation and carrying out all associated tasks.

F. Be able to stop a machine to make it safe, purge the machine, reduce temperatures and shut down correctly.

G. Demonstrate the removal and cleaning of the strand die-head on a twin-screw extruder.

H. Show how to correctly fill out a setting-sheet for a new material.

Phase 3 – Extrusion

On-The-Job Assessments for Apprentices

A. Demonstrate the safe connection of ancillary equipment for the extrusion process (hoppers, water baths, air knife, granulator)

B. Demonstrate the correct procedure to remove and clean a die.

C. Demonstrate correct procedure to install a die.

D. Identify and describe/demonstrate the typical parameters and uses for a range of extrusion grade materials.

E. Demonstrate correct manual handling techniques when handling raw materials.

F. Demonstrate basic knowledge of technical drawings using a range of Product, die and machine drawings.

G. Describe/demonstrate the construction of an extrusion line to include various machine configurations.

Phase 5 - Extrusion

On-The-Job Assessments for Apprentices

Note on phase 5: The product selected for production is a low spec simple product and the apprentice will carry out these duties unassisted.

A. Set and operate a range of extruders and ancillary equipment as specified to produce an acceptable product at required output rate.

B. Interpret the industry Code of Practice and carry out the subsequent operational inspection procedures drawing conclusions and initiating any remedial action.

C. Demonstrate the effects on extruded component dimensions & quality with changes to process parameters such as: Screw and haul speed, Vacuum pressure, cylinder and die temperature etc.

D. Evaluate and interpret the product specification requirements and achieve dimensional accuracy and surface texture on the extruded product.

E. Recognise general extrusion defects due to incorrect machine conditions systematically identify causes and apply remedial and preventative action.

F. Demonstrate the ability to setup an extrusion process from a baseline of no settings entered, to produce an acceptable product using a predefined set of product criteria and then demonstrate a material / product change over.

G. Demonstrate extrusion tooling (calendar rollers) assembly in correct assembly sequence with due consideration to tooling selection and adhering to tooling assembly procedures.

H. Carry out all production quality checks about the proper running of a particular extrusion system

Phase 7 - Extrusion

On-The-Job Assessments for Apprentices

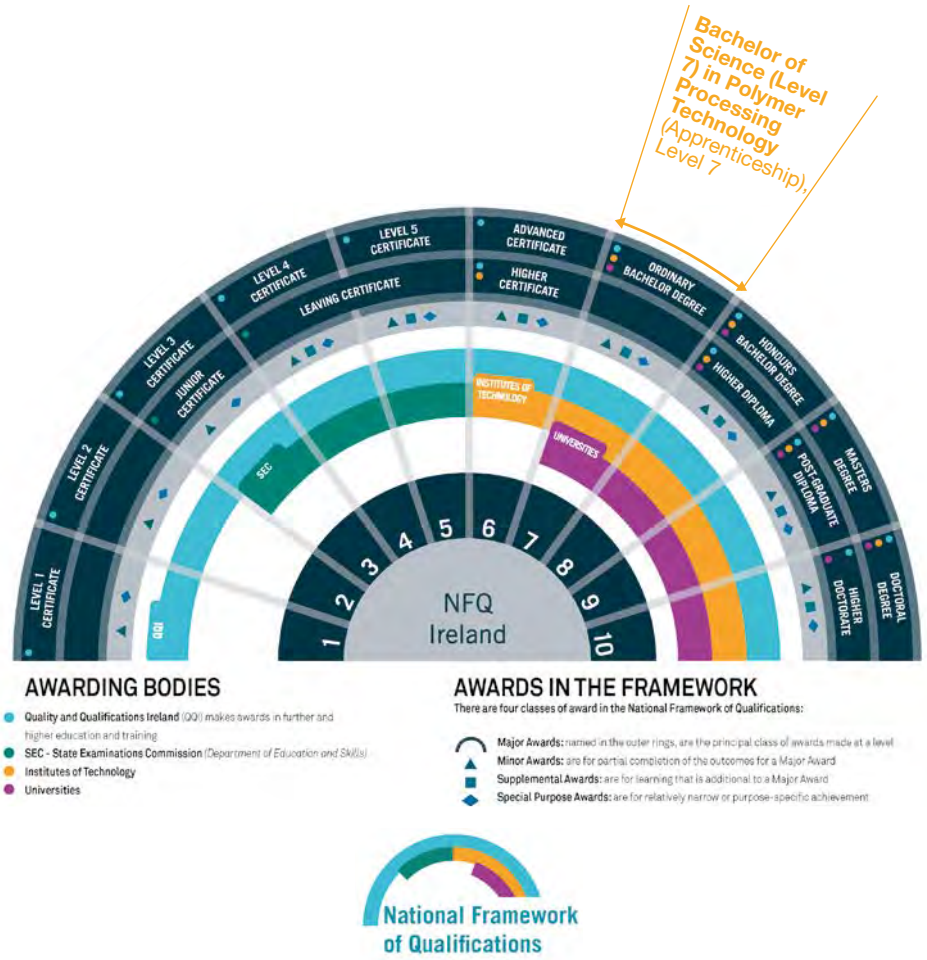
A. Prepare, plan and complete a full tool / mould change on a production machine to the point of start-up, without assistance and using safe working practice.

B. Select and set-up a robust extrusion process to produce a high spec, turn-key product to specification using a production machine, without assistance and using safe working practice.

C. Set-up of all ancillary equipment associated with an extrusion machine.

D. Evaluate a range (approx. 5) of polymer types and their working characteristics including the setup, processing, fault finding of quality defects and the suitability of ancillary equipment associated with these polymers (company specific).

E. Complete a quality control assessment, yielding a successful product within specification.



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