2 Processes

1 Future shapes

Start here **1** Work in pairs. Look at the photos and discuss these questions.

1 Do we make these items from plastic now?
2 Do you think that we will make them from plastic in the future?

Listening **2** 05 Listen to these five news reports. Match four of them with the pictures in 1.

A: News report _____ C: News report _____
B: News report _____ D: News report _____

What is the other report about? _____

3 Listen again and write the report number under the correct heading.

designed but not yet manufactured	already manufactured and in use now	planned or expected in the future

Scanning **4** Practise your speed reading. Look for the information you need on the SPEED SEARCH pages (116–117). Try to be first to answer these questions.

Which plastic is used for making:

1 protective goggles _____ ?
2 oars used in rowing boats _____ ?
3 volleyball nets _____ ?

Reading

5 Read this article, and write the letters of the paragraphs A–F which deal with these time frames.

1 the future A ___ ___
2 a specified time in the past ___
3 an unspecified time in the past ___
4 the present ___

The future of plastics in aerospace engineering

A The world will be a very different place in the year 2035, and I believe that plastics will play an important role in that new world.

B In aerospace engineering, for example, it is probable that before 2035 they will make the fuselage (body) and wings of an aircraft entirely from plastics or plastic composites.

C However, it is unlikely that they will make the actual engine from plastics at any time in the future. And they certainly won't make one before 2035.

D Some manufacturers are trying right now to build aircraft fuselages from plastic composites.

E For example, one aircraft manufacturer has already designed a fuselage containing more than 50% carbon fibre (a plastic composite).

F They began the project three years ago, and they produced the drawings at the end of last year.

6 Tick the predictions below which are the same as the ones in the article in 5. Write the letter of the paragraph which includes the prediction.

1 It's possible that they'll build a plastic engine in the future. ☐ ___
2 It's likely that they'll construct a plastic wing before 2035. ☐ ___
3 They probably won't make a plastic engine before 2035. ☐ ___
4 They definitely won't manufacture a plastic engine before 2035. ☐ ___
5 They'll possibly make a plastic fuselage before 2035. ☐ ___
6 They probably won't build a plastic engine in the future. ☐ ___

Language

It's **certain** that they will They will **certainly** / definitely	make a plastic fuselage one day. not make a plastic engine before 2035.
It's **probable** / likely that they will They will **probably**	make a plastic fuselage before 2035. not make a plastic fuselage next year.
It's **possible** that they will They will **possibly**	make a plastic wing one day. not make a plastic wing before 2035.

7 Say each of the predictions in 6 in a different way with the same meaning.

Example: *1 They'll possibly build a plastic engine in the future.*

Speaking

8 Go round the class making predictions. Use dates and express either *certainty*, *probability* or *possibility* about each one.

Example: *I think that humans will probably reach Mars before 2040, but it's unlikely that they'll get to Saturn or Jupiter before then.*

2 Solid shapes

Start here **1** In pairs discuss the process illustrated in the diagrams, and answer the questions below.

Injection moulding of plastic

Fig. 1

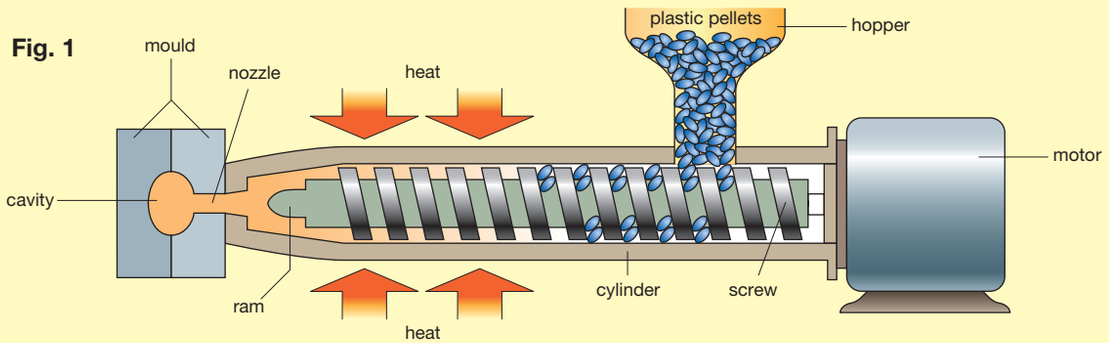


Fig. 2

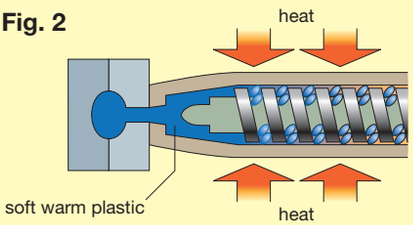
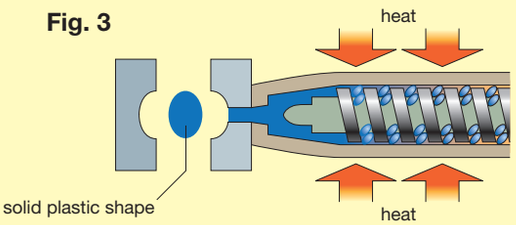


Fig. 3



1 Why is heat used?
2 What is the function of the screw?
3 Which of the following items do you think are shaped using this process?






Reading **2** Rearrange these sentences into the correct order according to the diagrams in 1.

Injection moulding of plastic

A The mould opens and the cold, hard, solid plastic shape is ejected. ☐
B The screw stops rotating and then a ram in front of the screw moves straight forward. ☐
C Small pieces (or pellets) of plastic are fed from the hopper into a cylinder. 1
D The soft, warm plastic is pushed towards a nozzle by the ram. ☐
E The pellets are pushed along the cylinder by a rotating screw, and heated. ☐
F Inside the cavity, the plastic is cooled by the mould, and becomes hard. ☐
G The soft plastic is injected through the nozzle into a shaped cavity between the two halves of a mould. ☐

3 Check your answers to the three questions in 1.

Vocabulary **4** Find two words in 2 which contain the letters 'ject'. Which one means *thrown out* and which one means *pushed in*?

Language

With an *active* verb, the *subject* = the *agent*. The subject carries out the action.

subject = agent	active verb	object
A rotating screw	pushes	the plastic pellets.

With a *passive* verb, the *subject* ≠ the *agent*. The subject does not carry out the action. The agent does the action to the subject.

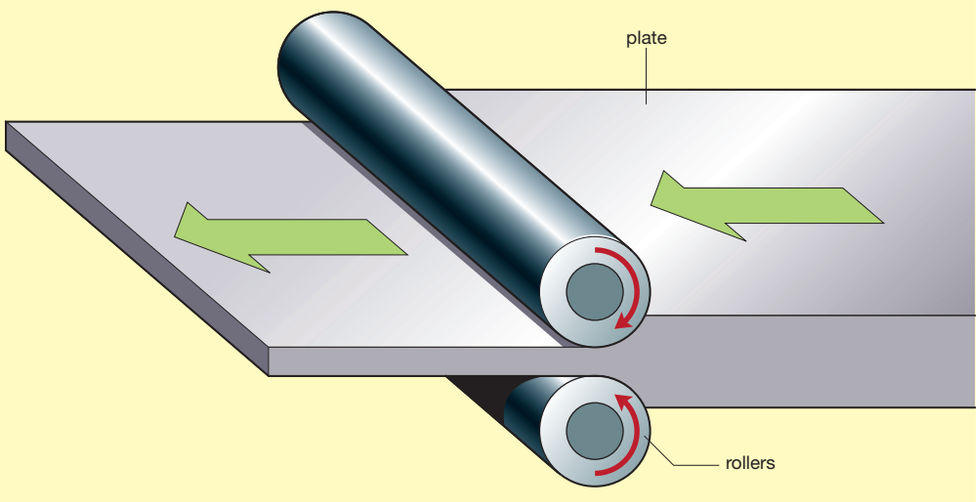
subject	passive verb		agent
	be	past participle	
The plastic pellets	are	pushed	by a rotating screw.

5 Look at the diagram in 1 again and complete these sentences, using the active or passive forms of the verbs in brackets, as appropriate.

1 Plastic pellets _____ (store) in a hopper at the top of the machine.
2 The pieces of plastic _____ (transfer) from the hopper into a cylinder.
3 The plastic _____ (propel) along the cylinder by a rotating screw.
4 The heaters around the cylinder _____ (raise) the temperature of the plastic.
5 As a result, the soft, warm plastic softens and _____ (flow) more easily.
6 The plastic _____ (force) under pressure through a small nozzle.

Writing

6 Rewrite the paragraph below. Improve it by changing some (but not all) of the verbs to the passive form. Where appropriate, delete the agent. Make any other necessary changes. Begin some sentences with *First*, *Next*, *Now* and *Finally* as appropriate.



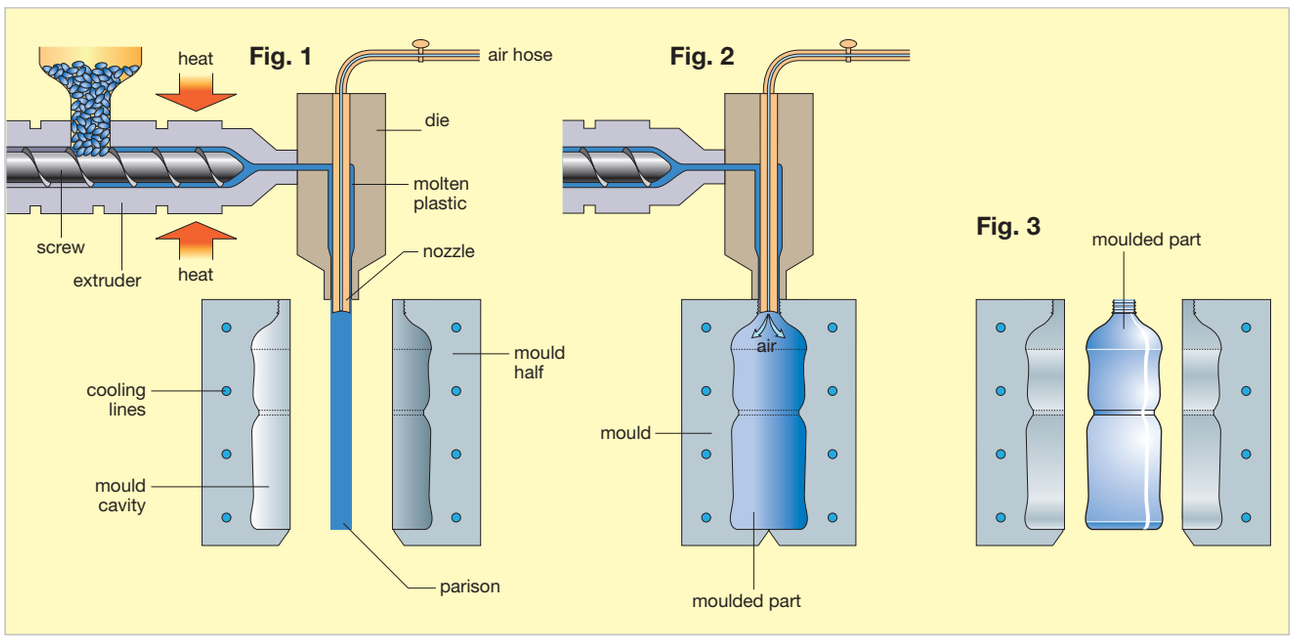
THE METAL-ROLLING PROCESS

Someone adjusts the gap between the rollers to the correct width. Someone switches on the motor, and the heavy rollers begin to rotate in opposite directions. A worker heats the metal plate. Then something pushes the hot metal plate through the gap between the rollers. As the hot metal moves between the rollers, the rollers compress it to a thinner shape. The metal comes out from the rollers in the form of a metal sheet. Someone then cools the metal sheet.

3 Hollow shapes

Start here **1** Work in pairs. How do you think the plastic items in the main picture were shaped? There's a clue in the two smaller photos.

Listening **2** With your partner, study the illustrations, and then rearrange the notes below into the best order for a talk on extrusion blow moulding.



The extrusion process (SEE FIG. 1)

- movement of warm, soft molten polymer along cylinder ☐
- extrusion of molten polymer into mould ☐
- heating and melting of polymer pellets ☐
- transfer of polymer pellets from hopper to cylinder of extruder [1]
- movement of cold polymer pellets along cylinder ☐
- rotation of screw ☐

The blow moulding process (SEE FIGS. 2 AND 3)

- cooling of plastic bottle shape ☐
- expansion of polymer to fit shape of mould ☐
- blowing of compressed air into molten polymer ☐
- ejection of plastic bottle from open mould ☐
- inflation of molten polymer by compressed air ☐
- closure of two halves of mould with molten polymer inside [7]

polymer = plastic
molten = melted

3 06 Listen to this talk and check the order of your notes.

4 Listen again and fill in the gaps with these phrases.

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1 As you _____ in Figure 1, there is an extruder at the top left …
2 As _____ in Figure 1, there is a ninety-degree angle …
3 As Figure 1 _____, the hot, soft plastic is extruded down …
4 Then, as Figure 2 _____, the two halves of the mould close.
5 The second stage _____ in Figure 2.
6 The third and final stage _____ in Figure 3.

Vocabulary

5 Make a list like the one below. Write the first word from each note in 2 above under the noun column and write the related verb under the verb column.

noun	verb
movement	move

Language

6 Change the notes in 2 into full sentences, using the verbs from 5. Write them in the correct order. Use either active or passive verbs, as needed.

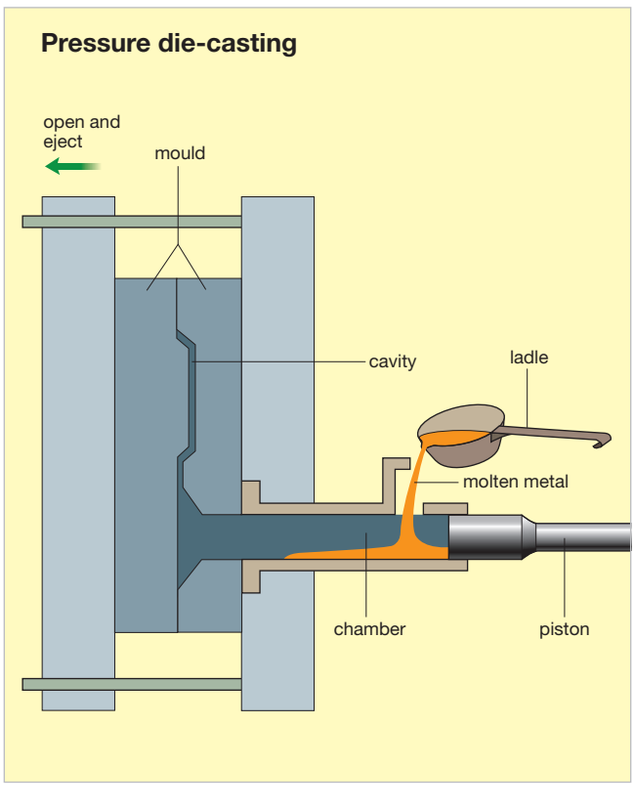
Examples:
1 The polymer pellets are transferred from the hopper to the cylinder.
2 The screw rotates.

Writing

7 Study the diagram and the notes below, and write an explanation of the process of pressure-die casting. Use *First*, *Then*, *Next* and *Finally*, and the passive where appropriate.

Begin: *First, some metal is heated until it melts. Next the molten metal …*

Pressure-die casting
- heat metal until it melts
- pour molten metal into chamber
- piston moves along chamber
- piston pushes molten metal under pressure into cavity
- cavity is between two halves of mould
- molten metal fills cavity
- metal cools and becomes solid
- open mould
- eject solid metal component from mould



Speaking

8 Explain the process in 7 to the class, or to a partner. Do not look at your writing. Refer to the diagram where appropriate, using phrases from 4.

Example: *Next, as you can see in the diagram, the molten metal …*