Your notes

GCSE Engineering: revision notes

Material removal

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Wasting processes

- Material removal (**wasting**) shapes a part by cutting material away. It creates waste, such as **swarf** (metal shavings).
- Hand processes: sawing with a hacksaw, filing, drilling with a hand drill, and **tapping** threads with taps and dies.
- Machine processes: drilling on a pillar drill, turning on a **centre lathe**, milling, grinding and cutting with a bandsaw.

Turning and milling

- On a **centre lathe**, the workpiece rotates and a cutting tool moves along or across it. It makes cylindrical parts, such as shafts. Operations include facing, parallel turning, taper turning and drilling.
- On a **milling machine**, the cutter rotates and the workpiece moves under it. It makes flat surfaces, slots and pockets.

CNC and thermal cutting

- CNC (computer numerical control) machines follow programmed instructions (**G-code**) to cut accurately and repeatably.
- Laser cutters cut sheet materials with a focused beam; plasma cutters cut thick metal plate using very hot ionised gas.
- CNC gives consistent quality and can run with little supervision, but machines are expensive and need programming.

Safety

- Use machine guards, wear eye protection, tie back long hair and loose clothing, clamp the work securely, and know where the emergency stop is. Don't wear gloves near rotating parts.

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Key terms

Wasting	Shaping a part by removing material.
Swarf	Waste shavings from cutting metal.
Centre lathe	A machine where the workpiece rotates against a cutting tool.
Milling machine	A machine where a rotating cutter shapes a moving workpiece.
CNC	Computer numerical control of machine tools.
G-code	The programming language used by CNC machines.
Tapping	Cutting an internal thread with a tap.

Quick questions

Cover the answers and test yourself: remembering is what makes it stick.

1. What is wasting?
2. On a centre lathe, what rotates?
3. On a milling machine, what rotates?
4. Which machine is best for making a cylindrical shaft?
5. What is swarf?
6. What does CNC stand for?
7. What is an advantage of CNC machining?
8. What is tapping?

Answers

1. Shaping a part by removing material
2. The workpiece
3. The cutter
4. A centre lathe
5. Waste shavings from cutting metal
6. Computer numerical control
7. Accurate, repeatable parts
8. Cutting an internal thread

What to do next

Practise 10 questions on this topic

Try 3 exam questions, with mark schemes

Read the lesson, one step at a time

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