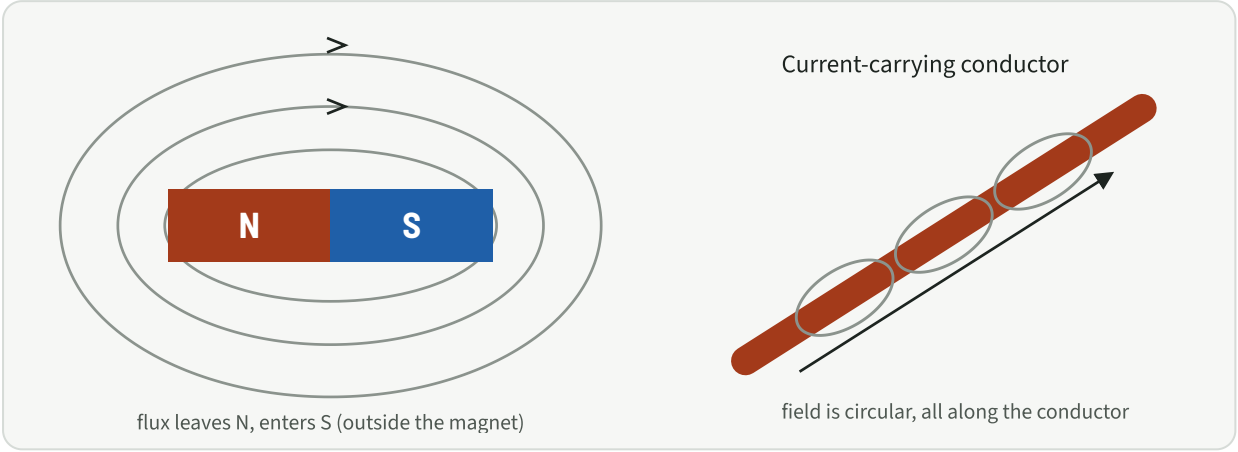
MAGNETISM AND INDUCTION

HOW DOES A SPINNING COIL MAKE ELECTRICITY?

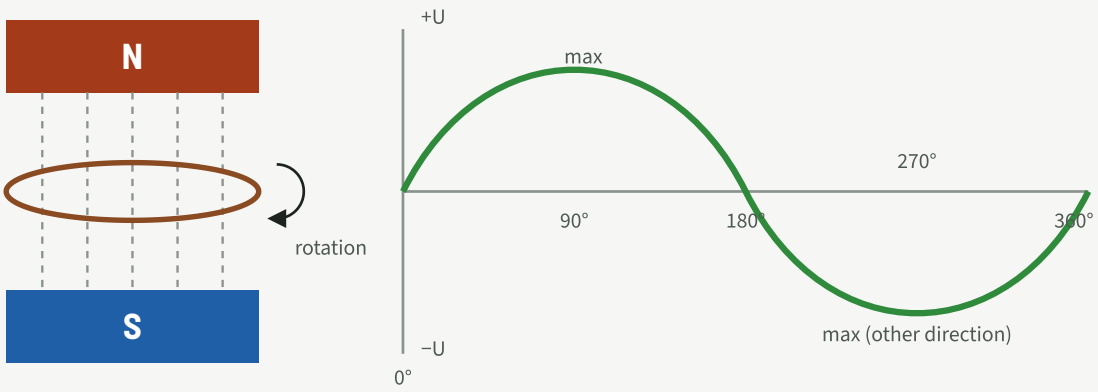


- **Like poles repel, unlike poles attract.** With two N poles together the flux lines push outwards away from each other. With N and S together the flux lines run straight between them, and they attract.
- The lines of **magnetic flux** run from the North pole round the outside into the South pole.
- **Flux density** is the amount of flux in a given area. Lines close together mean a strong field, and lines far apart mean a weak one.
- **When a conductor carries a current, a magnetic field forms around it.** The field is circular and runs the whole length of the conductor. It goes clockwise or anticlockwise depending on the **direction of the current**. Motors and transformers both rely on this.
- Flux lines are invisible. Sprinkle iron filings over a magnet (Faraday's school-physics experiment) and you can see their shape.

Electromagnetism is how UK electricity is made: in a power station, a coil rotates inside magnetic fields, generating at about **25,000 V**.

Magnetic induction: how a generator makes AC

Magnetic induction is one of the main sources of EMF. A loop of wire is **mechanically rotated** between the N and S poles of a magnet. As it cuts the lines of flux, a voltage is induced, which is the electrical output.



The coil starts where no flux is being cut, at 0 V. It rises to a maximum at 90° as it cuts the most flux, back to zero at 180°, to a maximum in the other direction at 270°, and back to zero at 360°. One full turn gives one complete sine wave.

- One full turn gives **one cycle**. At 50 Hz the loop turns **50 times a second**, giving 50 cycles and **100 peaks** (one each way per cycle).
- That's why lights sometimes flicker when you look at them through a phone camera. The camera is catching the 50 Hz cycle.
- The peaks at 90° and 270° are current going one way, then back the other way. It isn't "positive then negative electricity".

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