Residual Magnetism < 2mT

Why demagnetisation of the load can be critical

In material handling applications where the steel has to pass though automated processing lines, residual magnetism in the load can cause serious problems. The load may 'stick' to machine parts as it travels through the production line or it may attract other small pieces of steel (washers, bolts, swarf etc).

In these situations efficient demagnetisation of the load is essential. SmartPick offers configurable demagnetisation for eliminating a maximum amount of residual magnetism in minimum time.

What happens when steel becomes magnetised?

Ferromagmagnetic materials such as such as mild or quality steel which have never been subjected to a magnetic field are made up of randomly ordered magnetic ions as represented below in Figure 1:. Steel, when in this state, has no magnetic effect on its surroundings (see point a in Figure 3:).

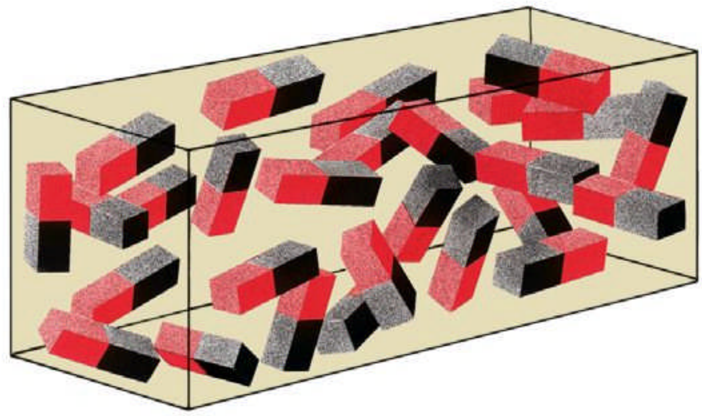


Figure 1: Ions positionned at random (material demagnetised)

When a positive magnetic field is applied, the magnetic ions start to fall into alignment. The more powerful the magnetic field, the more tightly the ions are aligned. If all of the ions are aligned as shown in Figure 2:, the material is said to be magnetically saturated (Point b in Figure 3:). For steel the magnetic saturation is equal to 2.4 Tesla.

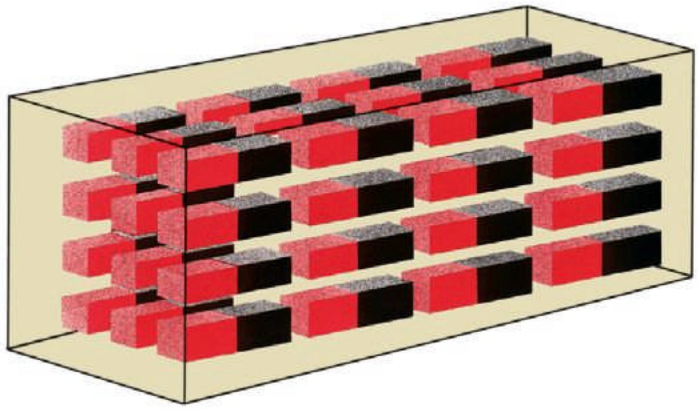


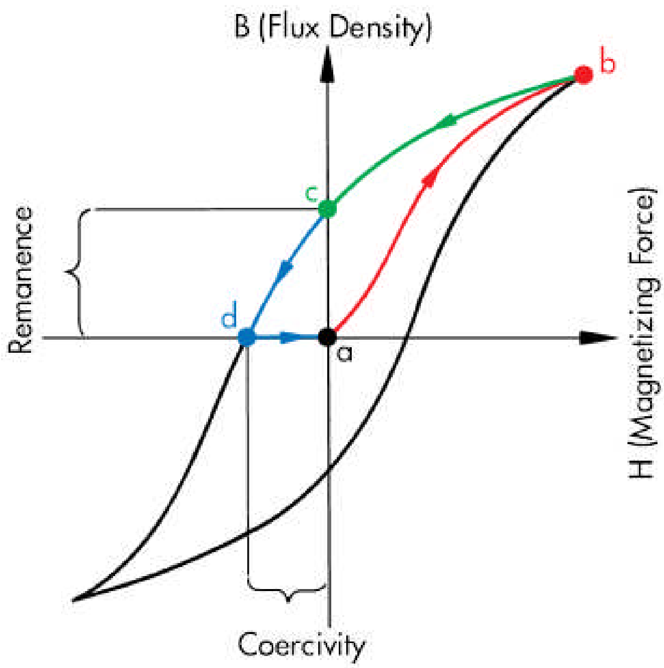
Figure 2: All ions aligned (material magnetically saturated)

However, when the external magnetic field is removed, the ions do not return to their random state. This leaves some residual magnetism in the material, an effect known as remanence (Point c in Figure 3:).

This residual magnetism has to be removed by some external means. The actual method applied depends mainly on the magnetic properties of the material. Material such as mild steel loses its magnetism quickly and is said to be 'soft magnetic'. Quality steel on the other hand, loses its magnetism very slowly and is therefore said to be 'hard magnetic'.

RDS (Reverse Degauss System)

RDS demagnetisation eliminates residual magnetism from mild steel. Applying a negative magnetic field causes the magnetic ions to gradually adopt a random alignment. When the opposing field is turned off (Point d in Figure 3:), the ions are randomly aligned, thus eliminating the residual magnetism.



- Magnetisation
- Magnet switched off
- Demagnetisation with RDS

Figure 3: Hysteresis of soft magnetic mild steel

RDS cannot be applied to hard magnetic material because the negative magnetic field causes all the ions to adopt a reverse alignment instead of returning to a random state.

DDS (Downcycle Degauss System)

DDS reduces the residual magnetism in hard quality steel by applying a series of polarity changes in a magnetic field of ever decreasing amplitude as shown below in Figure 4:

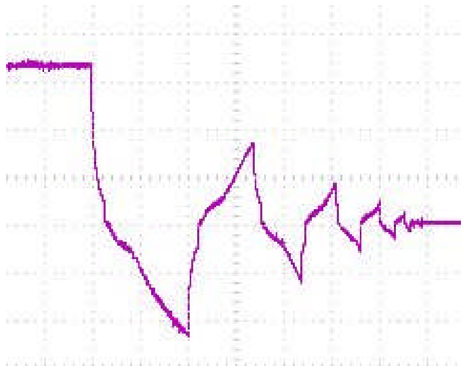


Figure 4: Typical magnet current behaviour during DDS demagnetisation

With this approach the magnetic ions are effectively 'shaken' into a random state, reducing the residual magnetism to around 2 mT. Figure 5: shows the resulting hysteresis:

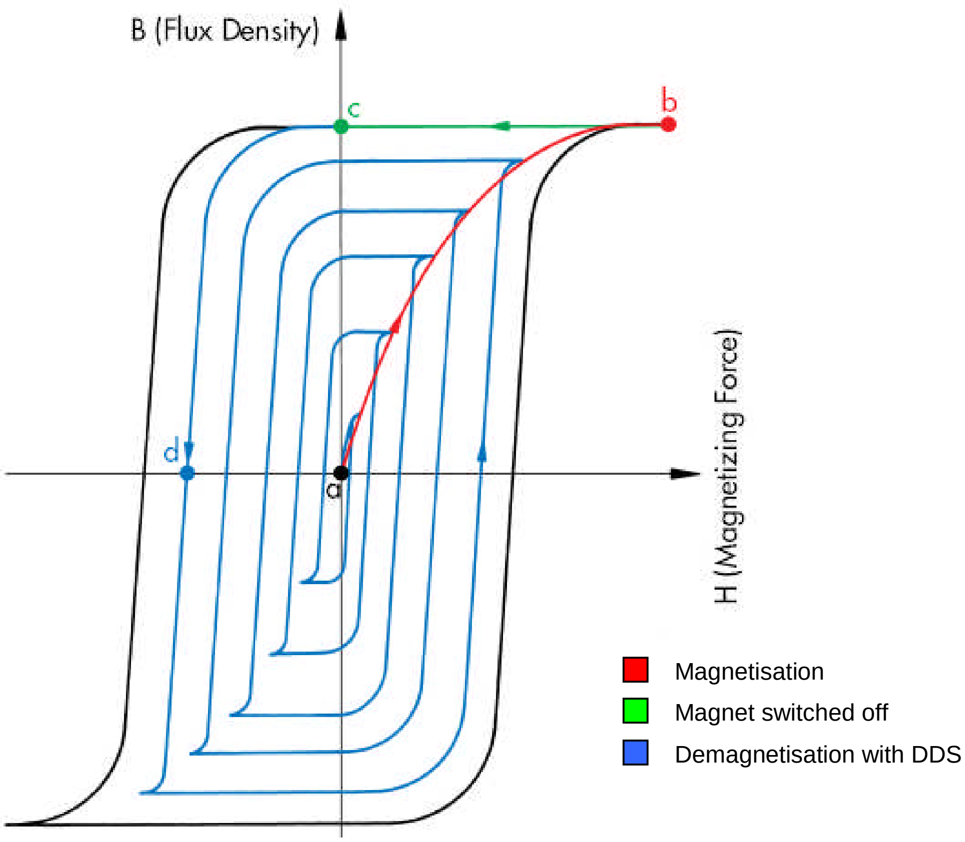


Figure 5: Hysteresis of hard magnetic quality steel