

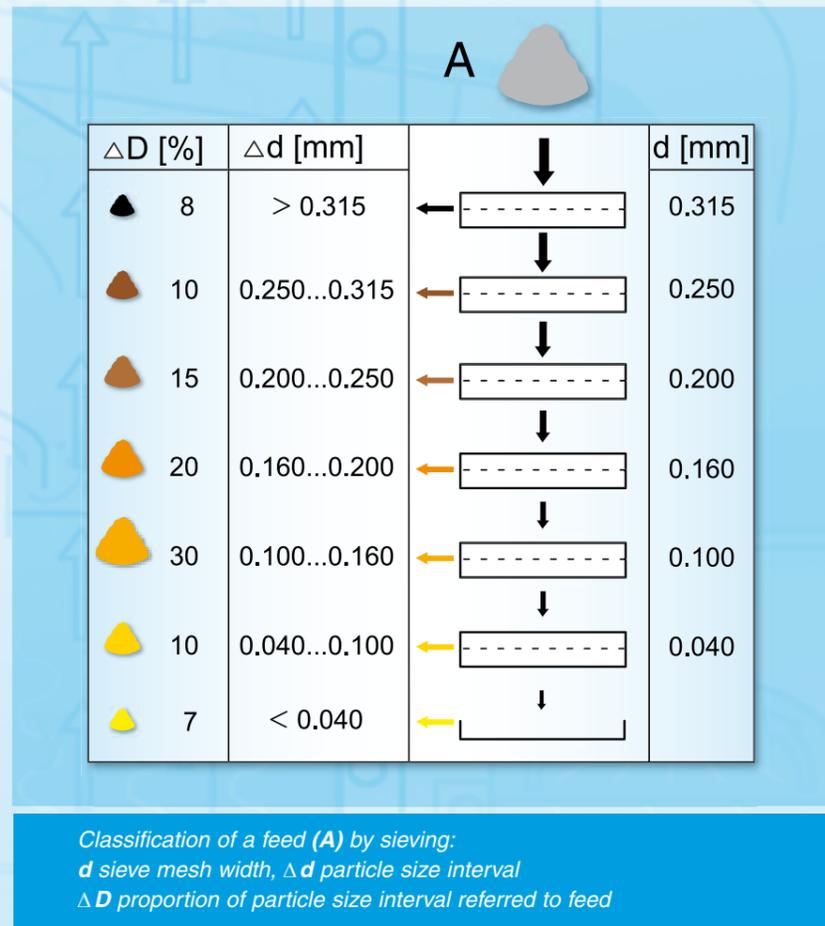
BASIC KNOWLEDGE CLASSIFYING

Classification is a mechanical separation method for solid compounds. It utilises either, the geometric features (size) or the settling velocities of the individual particles for the separation process. Accordingly, a distinction is made between sieve and flow classification.

Ideally, a classifier separates a feed with differing particle sizes into coarse and fine materials. The coarse material would then contain all the particles larger than a specific separation size, and the fine material all the particles smaller than that size.

The simplest example of a classifier is a sieve. In this case the separation size is determined by the sieve mesh width. With the sieve layout shown, it is possible to sort a feed into several particle size classes.

A practical example of the application of such a layout (though with larger sieve mesh widths) is the separation of ballast, gravel and sand from quarried material.



In **sieving**, each particle is compared to a sieve mesh according to its size and shape. Irregularly shaped particles may be hindered in passing through the sieve mesh depending on their positioning or orientation. The particles may also obstruct each other, or adhere to each other. It is therefore necessary to provide each particle with the opportunity to pass through the mesh multiple times. This can be accomplished, for example, by vibrating, tumbling, projectile or horizontal movements of the sieves.

Flow classification may take place in gases (air) or liquids (water).

In *wet flow classification*, the differing settling velocities of particles in a liquid flow are used as a separating criterion. The settling velocity

depends on the size, density and shape of the individual particles and the resultant forces due to flow resistance and weight.

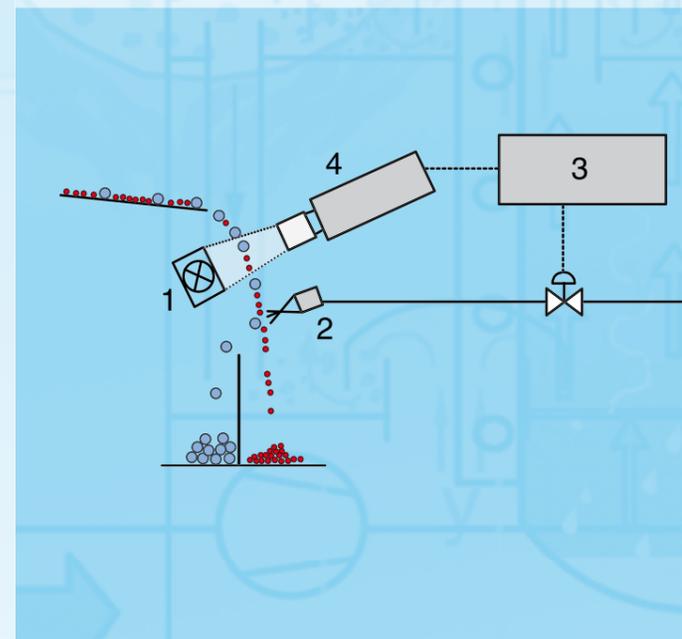
In *gas flow classification (wind sifting)*, an airflow is used for classification instead of a liquid. The underlying laws of the separation principle applying to this are identical to those of wet flow classification. Wind sifters are used, for example, in the cleaning of corn, to separate off toxic components such as *secale cornutum (ergot)*.

BASIC KNOWLEDGE SORTING

Sorting is a mechanical separation process in which a solid compound containing different material characteristics is divided into fractions with the same material characteristics. In sorting, properties such as density, colour, shape, wettability or magnetisability are utilised.

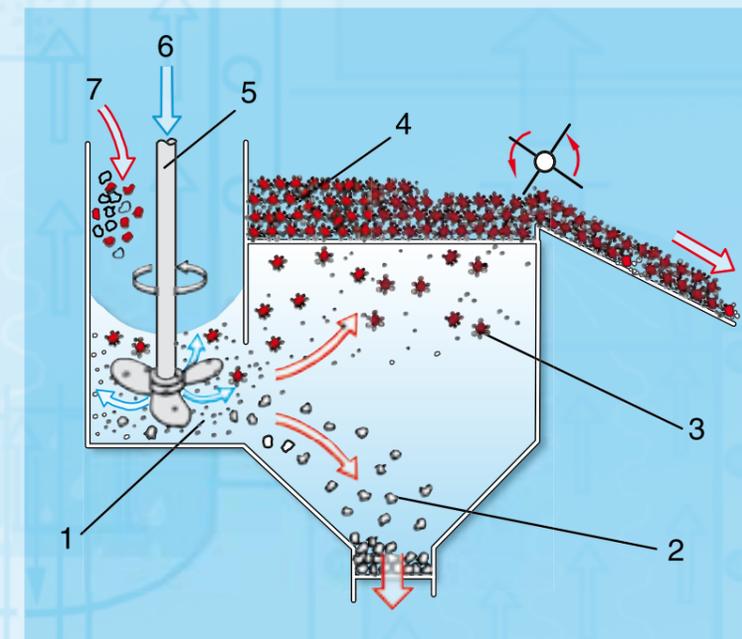
Where *density* is applied as the separation criterion, a **float-sink sort** is suitable. A solid compound is placed in a liquid. The particles in the compound which are of lower density than the liquid float on the surface, while higher-density particles sink. One application of this is in coal preparation, in which the coal is separated from the surrounding strata.

In **magnetic separation**, a solid compound is separated into its constituent components based on the *magnetic* properties of those components. Magnetic separators are used, for example, in coal and ore preparation.



Fundamental principle of an optical sorting process:
 1 light source, 2 compressed air jet
 3 image analyser with controller
 4 camera

The *shape and colour* of specific particles can be recorded from a solid compound using high-resolution cameras. Using a special electronic analysis technique, the detected particles can be separated out of the compound by an airflow. **Optical sorting methods** are used in the recycling of glass.



Fundamental principle of flotation:
 1 air bubbles, 2 wettable particles
 3 non-wettable particles, 4 foam
 5 stirrer with hollow shaft, 6 air, 7 solid compound

The *wettability* of specific materials with water in **flotation**, sorts fine-grained solids. The solid compound to be separated is placed in a container with water. Air bubbles are introduced into the water. The bubbles adhere to the solid particles which are not easily wettable with water. Those particles are carried with the bubbles to the surface of the water, where they form a solid-bearing foam which can be scooped off. No bubbles adhere to the water-wettable particles. They remain in suspension or sink to the bottom. Flotation is the most frequently applied method of sorting particles < 0.5 mm.