

BASIC KNOWLEDGE

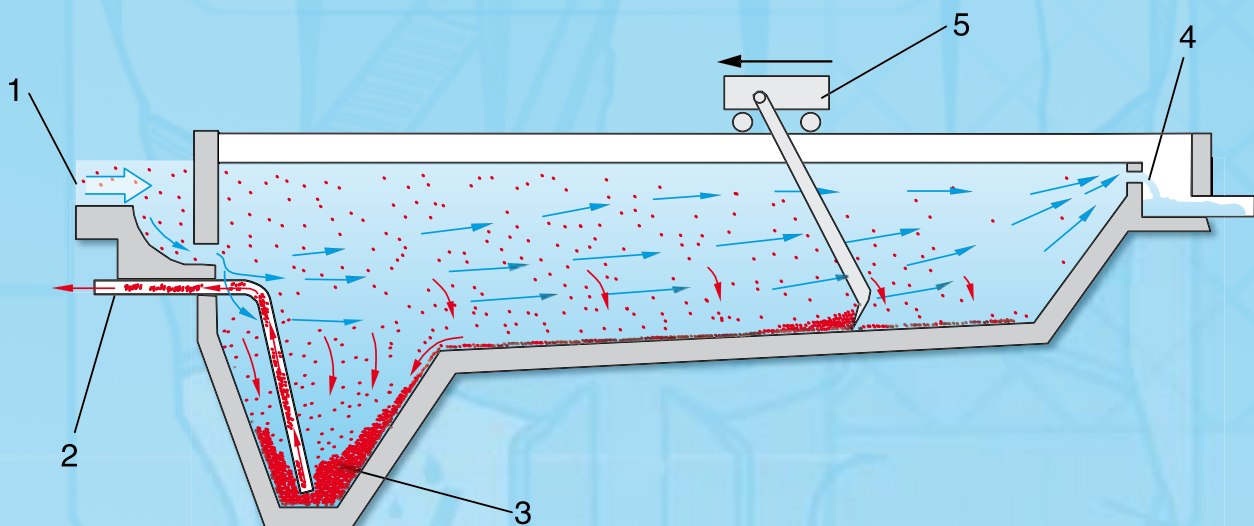
SEPARATION IN A GRAVITY FIELD

Mechanical process engineering in many cases utilises gravity to separate different phases. Gravity can be used to separate a solid phase off from a fluid. When solid particles are suspended in a fluid, gravity causes them to sink. For this to happen, the density of the solid must be greater than that of the fluid. The process is termed sedimentation. Fluid is the umbrella term for gases and liquids. It is used because most physical laws apply equally to both.

In terms of the **separation of solids from gases** the phrase “dust separation” is also used. The solid phase may, on the one hand, be a usable material, on the other hand, it may be an unwanted material (gas purification). In gravity separators the gas flow is routed at slower velocity through a separator channel. On their way, the particles sink and are collected.

In practice the **separation of solid/liquid compounds** (suspensions) takes place in sedimentation tanks through which the suspension continuously flows. The shape of the base may be rectangular or circular.

In rectangular tanks the suspension flows in on one side and flows out over the rim on the opposite side. On the way, the solid particles sink to the bottom of the tank. The tank floor is positioned at an angle to aid discharge of the solid material. There are also devices by which the settled solid (sludge) can be cleared from the tank bottom. Sedimentation tanks are mostly used in water treatment.



Sedimentation tank:

*1 waste water inlet, 2 sludge extractor, 3 sludge hopper, 4 clean water overflow
5 cart for sludge clearing*

The *settling velocity* of the particles is the key variable in the design of sedimentation tanks and separator channels. It is directly related to the particle size, the particle shape (flow resistance) and the difference in density between the fluid and

solid. If the particles in a suspension are very fine, or if the difference in density between the fluid and solid is slight, the settling velocity is very low. A technically useful separation by means of sedimentation is then not possible. Another variable

influencing the settling velocity in liquids is the concentration of solid particles. At high concentrations, sedimentation is hindered. As the concentration increases, the so-called cluster settling velocity becomes less than the velocity of the single particles.