



What does coagulation involve?

- Coagulation is the process by means of which the colloidal particles are destabilised (i.e. the nature of the colloidal particles is changed so that they form flocs through the process of flocculation that can be separated from the water). Destabilisation is achieved through the addition of chemicals (called coagulants) to the water. .

Different chemicals can be used as coagulants. The most common coagulants are aluminium sulphate, ferric chloride, lime, and polyelectrolytes. Coagulant-aids are also sometimes used. These are substances added in very small quantities to improve the action of the primary coagulant (See fact sheet on Coagulant Chemicals).

What does flocculation involve?

- Flocculation is considered to be part of the coagulation process and can take place in different types of equipment. A simple mechanical stirrer can be used for flocculation or a specially designed channel with baffles to create the desired flow conditions can also be used to flocculate the particles in the water. The basis of the design of a flocculation channel is that the flow velocity of the water has to be reduced from a high initial value to a much lower value to enable large, strong flocs to grow. If the flow velocity is too high the flocs may break up again, causing settling of the broken flocs to be incomplete.
- The objective of the flocculation step is to cause the individual destabilised colloidal particles to collide with one another and with the precipitate formed by the coagulant in order to form larger floc particles. Flocculation involves the stirring of water to which a coagulant has been added at a slow rate, causing the individual particles to “collide” with each other and with the flocs formed by the coagulant. In this way the destabilised individual colloidal particles are agglomerated and incorporated into the larger floc particles.
- Flocculation is controlled through the introduction of energy into the water (through paddles or by means of baffles in the flocculation channel) to produce the right conditions (required velocity gradient) for flocs to grow to the optimum size and strength. The velocity gradient (or G-value) is an extremely important factor that determines the probability of particles to collide and form flocs. If the G-values are too low, the probability of collisions is low and poor floc formation results. If it is too high, shear forces become large and this may result in floc break-up. Acceptable G-values for the coagulation process is between 400 and 100 s⁻¹ . For the flocculation process, it is in the order of 100s⁻¹.

