

OPTIMIZING THE PERFORMANCE OF FILTRATION PROCESS IN THE CONVENTIONAL DRINKING WATER PURIFICATION PLANTS

Kamal El-Nahas

Ph.D., Suez Canal Authority, Egypt, E-mail: k_elnahhas@yahoo.com

ABSTRACT

Rapid sand filtration is one of the most important basic technical processes used in surface water treatment for drinking. It is a mechanical separation process that utilizes the granular sand as a filtering medium to retain the particulates and allow the water passes as pure as possible. For another filter types, the filtering medium could be consists of other material such as anthracite, activated carbon or other grains. Filtration process usually takes place after coagulation, flocculation and sedimentation processes.

The important role of the sand filtration refers to its ability to remove chlorine-resistant pathogenic microorganisms and represent a final essential physical barrier producing a high-quality drinking water. The removal of particles and microorganisms from water through rapid sand filters takes place by several mechanisms that give them the ability to retain particulates with sizes much smaller than voids between the granular material. When particles are larger than the void spaces in the filter, they are physically removed by straining mechanism. Smaller particles can be removed by depth filtration that occurs when particles transport, depending on the physical and hydrodynamic properties of the system, through the pore spaces of a filter and stick to the media grains or another deposited particles. In depth-filtration, particulates are removed by their transport via a variety of mechanisms including sedimentation, flocculation, interception, diffusion and impaction.

More stringent regulations for the drinking water quality have been continuously developed and animate experts, researchers and designers to do their best for parallel development and performance improvement in the water treatment plant process facilities.

The aim of study is to present the current status of the rapid sand filters as the key unit process in the surface water treatment for drinking. The filters operational concepts and techniques within the normal cycle for a rapid sand filter operation are reviewed for optimization. The study have showed that understanding the theory and mechanisms involved in rapid sand filtration enable the operators to have a more efficient use of the process, with minimum troubles and shutdown periods, and obtain the optimization goals. The optimization goals include filtrate higher quality that can be achieved at higher loadings by more effective use of bed capacity. Also, the filter backwash optimization will save both water and energy achieving economic benefits.

Keywords: water treatment, filtration, optimization