next™ filtration technologies inc.

A Primer on the Use of next-Sand in Gravity Filtration Applications

Plants with conventional gravity filter media

- The most common modern filtration media for a gravity filtration cell is a layer of 20x40 mesh sand with anthracite on top. This combination is generally placed over a bed of coarse gravel/stones.

- Typically a depth of 1 ft of sand and 2 ft of anthracite is used for a total bed depth of 3 ft. This may be alternatively 1 meter.

- The flowrate per unit area of media is determined by the nature of the media (pressure drop characteristics) and the head pressure due to the height of water above the media.

- Since the water treatment plant usually does not want to backwash (BW) more than once per day, they regulate the flow in the range of 2 to 3 gpm/ft2. This is accomplished by maintaining a height of water about 6" to 8" above the clean bed media surface. If the height of water were increased, more water would flow and more sediment would be trapped and the cell would have to be BW more than once a day.

- As the media plugs the water level is increased to maintain flow. Depending on the design of the cells the height may be increased to as much as 4' to 7' above the surface of the media.

- During the entire filtration run their objective is to meet the demand for water by their customers while maintaining the water quality required by law.

- Water suppliers get into problems when the number of customers increases beyond the design of the plant. They have to increase the head pressure for a longer time which requires more frequent backwashing which make the plant more inefficient.

Advantages of replacing conventional media with next-Sand

- By directly replacing the two-media bed of sand and anthracite with a monobed of next-Sand the flowrate through the bed can be practically increased by 1.5 to 2.5 times – with and *improvement* in the water quality. This may be subject to the limitations of the plant design and the willingness of the plant operator to make adjustment to the process. (Note: The increase in flow may be less for water temperatures less than 65F (18C). The reason temperature is a factor will be explained later)

- The reason for the increase is due to the much lower pressure drop of next-Sand. Therefore, at a given head pressure the water will be filtered much more rapidly and without a loss of quality.

- The question arises if the BW frequency needs to be increased. The answer is generally no but depends somewhat on the flocculation/clarification efficiency and the nature of the water particles. Next-Sand will usually exhibit twice the capacity in dirt holding ability so if a plant BW once per day and converts to next-Sand with twice the flowrate the BW frequency is usually still once per day.

- To increase the flowrate of a plant that is already operating at capacity may require modification of the flocculation/clarification section. Usually modern plants use a combination of Alum (aluminum sulfate) and polymer flocculants. The industry has been sold on this as the standard method although it has some limitations.
    - If the process is "pushed" then the flocculated particles are not fully formed and the specific gravity of the floc decreases closer to that of water, for example 1.1. The result is that pin-floc starts appearing out of the clarifier which plugs the filter media earlier than expected.

    - Alum and polymer sludge retains a high percentage of water, 90% or more, and it is not always practical or cost effective to dewater it. Therefore, the sludge disposal costs are typically very high based on the sheer volume.

    - The dose of alum and polymer flocculants is usually directly proportional to the amount of turbidity in the water. The cost of handling very turbid water, greater than 500 NTU, can be extremely high.

    - Alum adds aluminum to the water, an undesirable neurological contaminant.

Next-Floc, super flocculant

- There is a very effective solution to this situation – change to an alternate type of flocculation consisting of ferric chloride (FeCl2) and powdered next-Floc. Next-floc is a pulverized form of next-Sand and exhibits the very unique electrochemical properties to synergize with ferric chloride – making a super-flocculant with specific gravity in the 1.3 to 1.4 range. This results in a faster, denser floc that is readily dewatered to form a minimal amount of sludge that can be sold to farmers as fertilizer.

- The modification of a gravity filtration plant with a combination of next-Sand filter media in the cells and ferric chloride and next-Floc flocculation will guarantee the maximum flowrate possible and optimum quality water.