WATER CYCLE TECHNOLOGIES

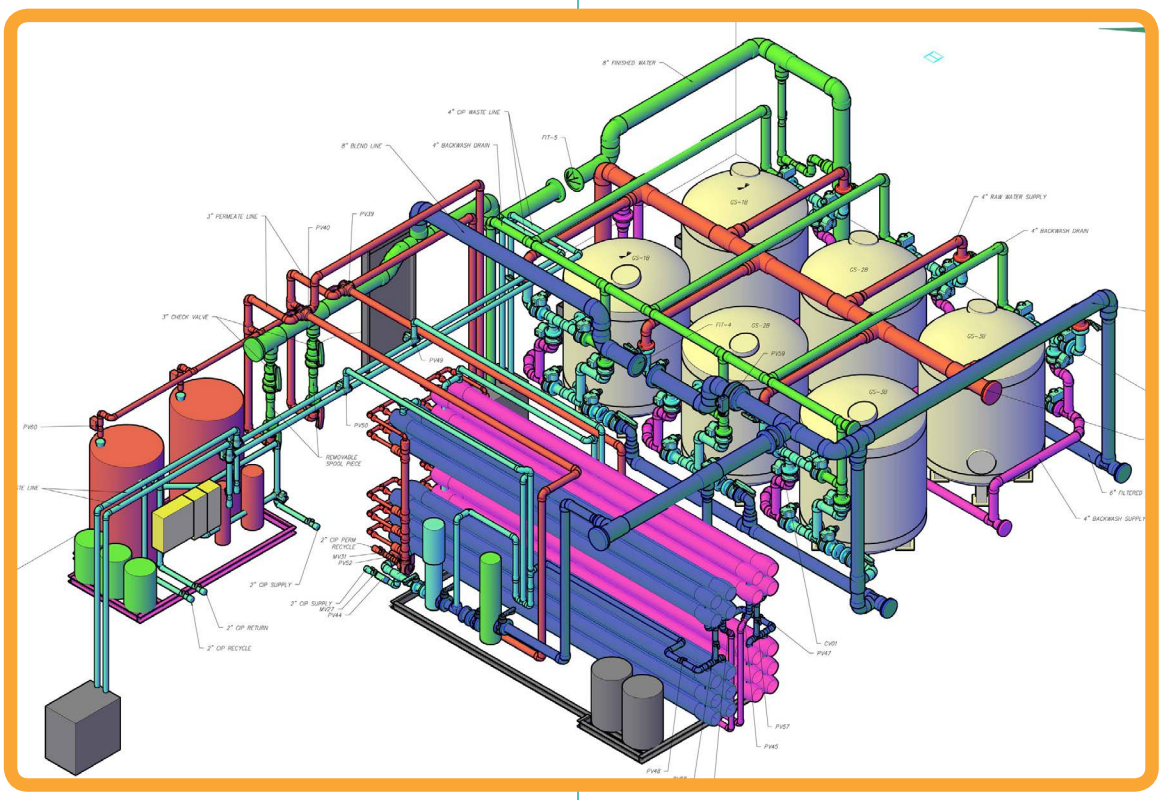
MUNICIPAL WTP

IFM Provides Filtration System To Improve Village Water Quality

IFM was hired to upgrade a water treatment facility to provide filtered and softened water to its customers. This village is currently using three existing wells to provide raw water to the newly installed water treatment facility. To improve their water quality, the facility has upgraded chemical feed equipment, added filtration and membrane softening.

must reject 95% of all TDS without any fouling or excessive high feed pressure to the NF membranes.

Before the raw water reaches the membranes , it is treated through a combination of aeration, oxidation and filtration prior to membrane softening. Aeration occurs first and then further oxidation is available from



The three wells providing the raw water are characterized by high total dissolved solids (TDS), high total hardness, high sulfate content and other scale forming minerals. These require attention to operate and to achieve long membrane life. To meet requirements the treatment plant must have 85% reduction in total hardness and the softening system

sodium hypochlorite and sodium permanganate. The sodium hypochlorite will oxidize iron, manganese, elemental sulfur and hydrogen sulfide and the sodium permanganate may be required if manganese is observed throughout the filters or to reduce chlorine demand.

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Low service pumps then convey the aerated and oxidized well water to Greensand PlusT filters. Greensand PlusT is a black filter media used for removing soluble iron, manganese, hydrogen sulfide, arsenic and radium from groundwater. The greensand plus continually regenerates with a free chlorine residual to maintain activation of greensand for proper filtration. Therefore, the filtered water should maintain a free residual of chlorine prior to dechlorination at the membrane feed.

Sodium bisulfite is added prior to the membrane feed inlet to de-chlorinate the remaining chlorine residual from the filters. This additional chemical treatment will maintain membrane integrity and performance. Without this chemical treatment, the free chlorine would attack and weaken the membrane allowing for expansion of membrane pores.

Nano filtration (NF) is a pressure driven separation process that employs a semi-permeable membrane and the principles of cross-flow filtration. The NF membrane softening system consists of two separate NF trains alternating in operation. Antiscalant is fed to each NF prior to membrane softening and rejected by the membranes to help reduce hardness, sulfate and carbonate scale on the membrane surface.

The DOW FILMTEC NF90-400 element is designed to remove a high percentage of TOC and THM precursors while having a medium to high salt passage and medium hardness passage. This element is ideal when good organic removal with partial softening is desired.

A separate skid was supplied for the NF membrane cleaning. The skid pumps prepared caustic, acid or surfactant based cleaning solutions and this cleaning process is completed as needed. If there is a drop in permeate quality or production, increase pressure drop through membranes and / or increased feed membrane pressure the membranes require cleaning.

The permeate will have a lower pH then the feed water which could be somewhat corrosive for public water distribution systems. Based off of permeate flow, sodium hydroxide will be added to the permeate to elevate the pH. The pH will be monitored so an abundance of sodium hydroxide is not added to the permeate.

Post chlorination rates will also be monitored at the point of discharge from the plant. Chemical injection is on the blend line with sample ports available on line prior to the high service clearwell.

Below is a table of all of the test results for the filtration unit that was installed for the village.

Test Parameter	Raw Feed	NF Feed	NF Permeate	Blended
pH	7.78	7.67	7.11	8.41
Alkalinity	324	320	62	113
Hardness	870	850	65	169
Calcium	494	495	37	95
Total Dissolved Solids	1112	132	299	
Conductivity		1549	201	
Iron	0.64		0.03	