

ACTIFLO® Clarifiers are Heart of Water Treatment Solution in Wilsonville, Oregon



Side view of the ACTIFLO basins



ACTIFLO effluent water troughs

CHALLENGE

To meet economic demands and reduction of the Oregon water table, the town of Wilsonville, OR investigated the use of the Willamette River as the source for a 20 mgd advanced water treatment plant. Many civic groups in the Wilsonville area believed that the Willamette River was less than suitable for use as a drinking water source. The town needed verification that there was a way to consistently treat the river water and produce drinking water to meet EPA public health regulations. The success of the treatment design relied on the stability of the clarification system. The clarifier had to be able to consistently treat the Willamette River so that downstream unit processes could be designed efficiently.

The project strategy was to find a clarifier process that offered stable operation, easy maintenance, and could temper the flashy Willamette River. Downstream processes were to include ozonation and GAC filtration.

To meet the project strategy, an ACTIFLO Process pilot study was performed from February through March of 2000 in order to investigate the performance of the process in treating Willamette River Water. As well, the pilot study generated accurate data for the design of the chemical feed systems and filtration system. For instance, the average alum dosage utilized during the pilot study was 16 mg/L. The average alum dosage utilized at full-scale plant is 12 mg/L. The filters were piloted at rise rates of 2.3-7.6 gpm/ft², the full-scale design used 2-8 gpm/ft² and have been effective at reducing effluent turbidity to <0.1 NTU.

The ACTIFLO process was chosen for installation after a highly successful pilot study and acceptance by the City of Wilsonville.

PLANT OVERVIEW

The Willamette water treatment plant consists of several unit processes which include raw water screens, a raw water pump station, an ACTIFLO microsand ballasted clarification Process, ozone oxidation, (GAC) filtration, a sludge thickening system, waste recirculation, clearwater effluent storage and high service pumps for distribution.

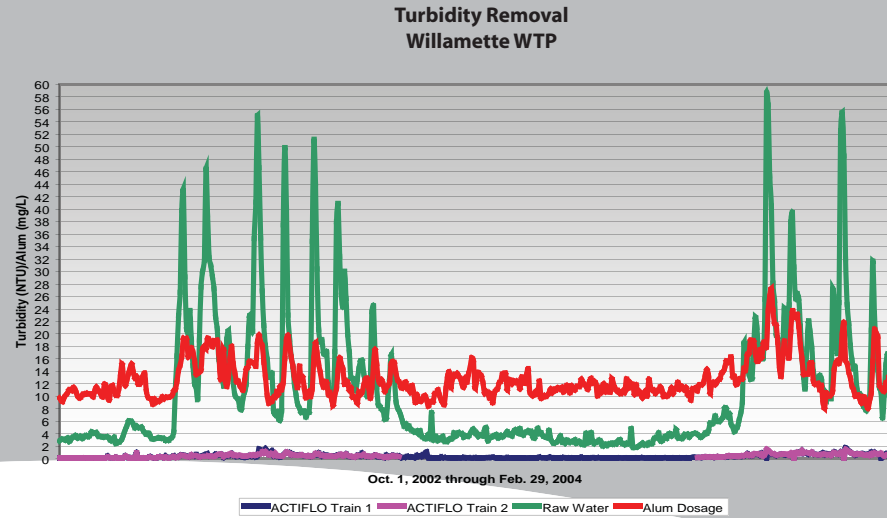
PROCESS SOLUTION

The clarification process consists of the ACTIFLO microsand ballasted clarifier. The ACTIFLO process has made treatment of the Willamette River routine. The turbidity is consistently less than 1 NTU (average 0.33 NTU) out of the ACTIFLO Clarifier and less than 0.1 NTU out of the filters. The ACTIFLO Process is designed to treat 15 MGD in a 2 x 7.5 MGD arrangement. Chemicals used include Chlorine, Aluminum Sulfate, LT225 (cationic, dry) polymer, and caustic (as needed for supplemental alkalinity). In the upstream piping of the ACTIFLO process, screened influent is injected with aluminum sulfate in front of a mechanical in-line mixer prior to entering the coagulation tank. The pre-coagulated water is rapid mixed again with high intensity mixers prior to flowing into the injection basin where microsand and 1/2 the polymer are dosed together. Treatment continues in the maturation tank where the remainder of the polymer is dosed and the ballasted flocs form and mature.

ACTIFLO® Clarifiers are Heart of Water Treatment Solution in Wilsonville, Oregon



Side view of the ACTIFLO basins



Alum floc generally has a specific gravity of 1.05-1.2, while microsand has a specific gravity of 2.65, thus providing accelerated settling in the settling tank. Microsand Ballasted floc enters the clarifier where it settles readily while clean water flows up through lamella tubes, thus polishing the effluent. Clarified water is collected in stainless steel launders before going to the ozone basins and downstream filters. The average effluent turbidity out of the ACTIFLO Process in the past year was 0.33 NTU. TOC removal is excellent with an average removal efficiency of 35%. Under the Interim Enhanced Surface Water Treatment Rule, the plant must remove 35% of influent TOC.

Slurry pumps withdraw the sand/floc mixture from the bottom of the settling basin and send it to hydrocyclones that separate the floc from the microsand. The microsand is recycled back into the ACTIFLO system, where it is reinjected along with polymer in the injection tank. The hydrocyclone overflow solids are sent to the sludge handling system for further treatment and disposal.

The detention time through the ACTIFLO Process at full capacity is less than 25 minutes for a corresponding design treatment rate of 20 gpm/ft². Each ACTIFLO system was installed with a coagulation/rapid mix basin with a design HRT of 3 minutes, and a maturation tank with an HRT of 9 minutes. As well, each ACTIFLO train is equipped with 2 hydrocyclones to process sand/waste sludge. Microsand losses at the plant have been consistently low, at approximately 4 pounds per MG treated.

Sand is added manually once or twice a week. Clarifier performance is very stable as is shown in the graph above. As the graph illustrates, the effective alum dosage ranges from 8-27 mg/L. Coagulant additions are tightly controlled using a Streaming Current Monitor (SCM). As the raw water spikes, the SCM translates the overall charge in the water to an optimized alum dosage. Both of the ACTIFLO Clarifiers produce water with <1 NTU effluent on a consistent basis, making the operation of downstream unit processes more effective. Filtered water turbidity averages 0.03-0.05 NTU.

CONCLUSION

Due to the effectiveness of the ACTIFLO Clarifiers, the downstream processes at the Wilsonville WTP operate smoothly and efficiently, producing a high quality drinking water for area residents to enjoy.



I. Kruger Inc.
401 Harrison Oaks Blvd.
Suite 100
Cary, NC 27513
Phone 919.677.8310
Fax 919.677.0082

krugerincmarketing@veoliawater.com
www.krugerusa.com