FORSTA FILTERS
Self Cleaning Water Filters

CASE STUDY: DRINKING WATER

Community of Encinal Village, NM

RESEARCH/DESIGN/FUNDING: Indian Health Service, Albuquerque Area
OPERATOR: Laguna Pubelo Utility Authority
REQUIREMENT: 24/7 system to remove large debris from spring water and protect LT2 compliance filters (5µ /1µ)
SYSTEM PARAMETERS: 85-100gpm, 50psi, 2" Line
DESIGN CONCEPT: Mutli-stage filtration, 1000µ, 50µ, 25µ
EQUIPMENT:

STAGE 1

B2-90 Stainless Steel 304L
1000µ Wedge-Wire Screen

STAGE 2

B2-90 Stainless Steel 304L
50µ Wedge-Wire Screen

STAGE 3

C2-90 Stainless Steel 304L
25µ Sintered Mesh Screen

According to the EPA, More than 94 percent of the nation's 156,000 public water systems serve fewer than 3,300 persons. These systems—classified as small by EPA—face unique financial and operational challenges in providing drinking water that meets EPA standards.

In the small community of Encinal Village, New Mexico, a spring-fed water system is the sole source of drinking water. The system is classified by the EPA as schedule 4, and serves approximately 200 persons and 60 homes.

The system is run by the Laguna Pueblo Utility Authority, and operates in compliance with the EPA's LT2 Enhanced Surface Water Treatment Rule (LT2ESWTR) which provides guidelines for source water monitoring and filtration.

Raw water from the springs nearby Encinal Village had very low turbdity (.05 NTU), but there was concern that strands of grasses and other plant material would shorten the service life of the 5 and 1µ cartridge filters selected for LT2 compliance.

David Steen, P.E., Sr. Field Engineer with the Indian Health Service, wanted to reduce the labor and replacement costs of disposable filters. Steen provided Forsta engineers with a raw water sample from the springs. The sample included fibers and other debris that were negatively affecting the fine cartridges. Results of sample testing would inform the screen selection for a new automatic, self-cleaning filter system to serve as pre-filtration to the finer polishing cartridges.

To assess the debris present in the raw spring water, Forsta engineers conducted tests using a descending sequence of screen mesh sizes. The test showed the concentration of debris at select sizes, and also indicated the finest screen appropriate to the Encinal spring water source.

1000µ+ 100µ+ 25µ+

Based on the test results (shown above), Steen selected a three-stage filtration sequence with 1000µ, 100µ and 25µ. The fully automated three-stage plan would provide reliable pre-filtration, extend the service life of the LT2 compliance filters, and reduce maintenance requirements.

The system went online in the summer of 2011. Operating conditions in the field were monitored over the course of several months. Based on an initial review of the flush frequency of each of the filters it was determined that reducing the 100µ screen to a 50µ alternative would help to balance the system.

Forsta engineer Eran Fischer provided an onsite training and installation evaluation to coincide with the screen change out. The simple screen adjustment effectively reduced the workload on the final 25µ filter and streamlined the operation of the system as a whole.

During the installation review Fischer confirmed that each of the filters had sufficient inlet pressure during backwash (min 40psi), minimal back pressure on the flush line, and that differential pressure on each of the filters returned to <1psi after each cleaning cycle was complete.

Flow from the springs remains at a fairly consistent 85-100gpm and the system operates on a 24/7 basis. The 1000µ filter is currently set to backwash once per day on timer. The 50µ filter backwashes twice per day based on pressure differential, and the 25µ filter backwashes once per hour based on pressure differential. Per 24 hour period, the cleaning cycles of the complete filtration system use approximately 216 gallons, with no interruption to system flow during the backwash sequence. Backwash water goes to a drain which feeds into a ditch collection and the irrigation system in the village.

Certified Water & Wastewater Operator Andrew Sweetman has operated the filters for Laguna Pubelo for 3+ years and is also the facility QA/QC Manager. When asked about the Forsta system he noted, “Working with the Forsta equipment has been relatively easy and hassle free. At our installation the filters are readily accessible, compact, easy to isolate for maintenance, and easily dissembled for periodic maintenance.”

Sweetman said that he would highlight the automatic backwash/self-cleaning operation of the filters, use with high pressure flows and the robust nature of the steel screens/filters as benefits of Forsta’s equipment.

Laguna's Three-Stage Filtration

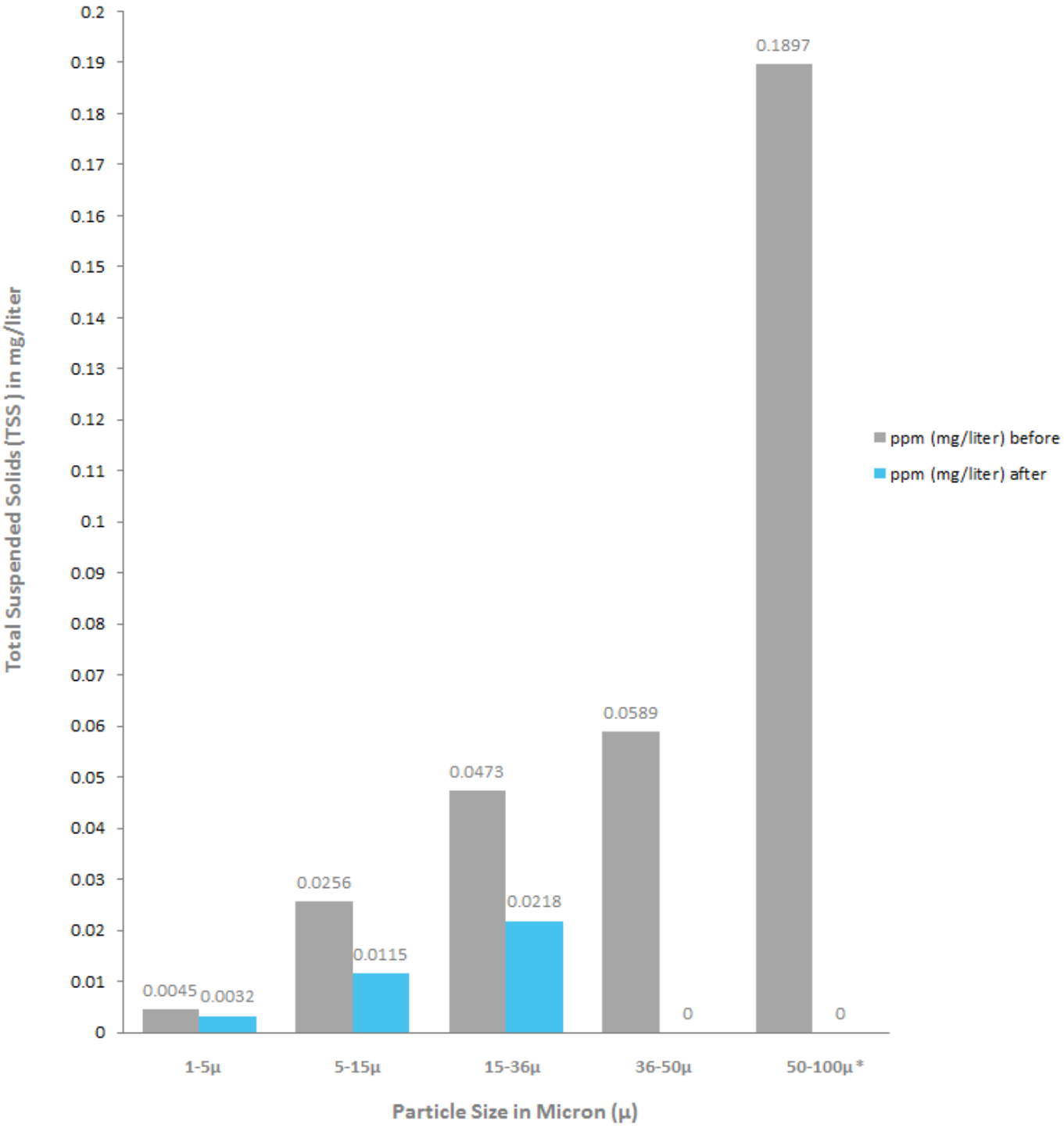
In order to examine the particle removal efficiency of the system at four years in operation, Sweetman collected one gallon samples prior to the 1000µ filter (raw spring water) and after the 25µ filter.

Total Suspended Solids (TSS) was reduced across the three-stage system from .33ppm to .04ppm, for an overall reduction of 88%.

Particle size analysis shows that 100% of particles were removed above the absolute degree of filtration (34-36µ) of the finest screen (25µ).

The analysis also shows a 63% particle reduction in the 1-36µ size range, with particle loading being reduced from .08ppm to .03ppm. Particle removal in this range is due to what has been referred to as "the filter cake effect." The filter cake effect describes the phenomenon of screen orifices becoming smaller as a screen accumulates dirt.

The graph below depicts the efficiency of Laguna Pueblo's three-stage filtration system by categorizing particle reduction into micron size ranges.



*TSS values are based on instantaneous samples taken before/upstream of the 1000 micron filter, and after/downstream of the 25 micron filter. ~ 5 anomalous particles were detected in the downstream sample at the 52µ and 82µ size, and are not depicted here. Introduction of these particles to the sample is attributed to a low-control sample collection/ transportation procedure. See full laboratory analysis reports for further reference.

With increasing drought conditions in the Western U.S., efficiency and water conservation is an important consideration for many municipal water systems. According to Steen the output of the springs on this specific system has not decreased. Laguna has however seen some decline in other wells.

In addition to using water efficient technologies like Forsta in their centralized treatment plant, Steen explained that Laguna has started to monitor individual meters and contact homes with suspected leaks.

The reliable and efficient four year operation of Laguna's three-stage self-cleaning filtration system has saved the water authority an estimated 2-4 cartridge filter replacements per year. This has amounted to reduced costs in equipment and labor.

See the published study at W&WD online:

About the Author:
Polly Stenberg is Director of Sales with Forsta Filters Inc. - A California-based original equipment manufacturer. Stenberg has conducted case study reviews with customers using Forsta self-cleaning filters in drinking water, wastewater, cooling, agricultural/landscape irrigation and industrial process systems. Polly can be reached at 310-837-7177 x 405 or by emailing polly@forstafilters.com www.forstafilters.com

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