FORSTA FILTERS
Self Cleaning Water Filters

CASE STUDY: MUNICIPAL WASTEWATER

FORSTA SOLVES DIFFICULT SECONDARY EFFLUENT FILTRATION PROBLEM FOR CITY OF CARSLBAD, CA RESTORES WATER RECYCLING SYSTEM FOR PRODUCTION OF NON-POTABLE WATER FOR IRRIGATION

BACKGROUND: Municipalities Collaborate for Wastewater Reuse and Efficiency

The Encina Wastewater Authority (EWA) is a public agency located in Carlsbad, California. EWA provides wastewater treatment services to more than 400,000 residents in northwestern San Diego County. EWA's facilities and services are essential for protecting the local ocean environment, preserving public health, and providing valuable water resources for the region.

EWA is owned by six public agencies governed by a Joint Powers Agreement. Under this Agreement, owners share in the operational and management costs of EWA, the objective being to cooperatively fund economical and high-tech facilities. The six owners are: the City of Carlsbad, City of Vista, City of Encinitas , Vallecitos Water District, Buena Sanitation District, and the Leucadia Wastewater District.

Founded in 1961, the EWA operates and maintains the Encina Joint Sewerage System which includes the Encina Water Pollution Control Facility, The Encina Ocean Outfall, The Agua Hedionda and Buena Vista Pump Stations.

EWA also manages and operates other regional water recycling and pumping facilities for their owners, including the Carlsbad Water Reclamation Facility, Buena Creek Pump Station, and the Raceway Basin Pump Station. The EWA System represents a significant infrastructure investment. Since 1980, the members of the Joint Powers Authority have invested over $600 million to protect the economy and quality of life for North County residents and businesses.

In September of 2016, the EWA commissioned a new 3.38 MGD Recycled Water System. The new system would process secondary effluent through a UF membrane system at the Carslbad Water Reclamation Facility and provide the treated effluent from the facility for local irrigation/land

application. Local golf-courses, parks, and landscapes would no longer need to rely on potable water for irrigation.

According to the City of Carlsbad, each gallon of recycled water that is used to irrigate parks, street medians, freeway landscaping and golf courses saves a gallon of drinking water. A gallon of recycled water is also about 16 percent cheaper than a gallon of potable water, because the city controls the production.

The City of Carlsbad has approximately 79 miles of recycled distribution pipeline which currently supplies more than 700 recycled points of connection.

NEW SYSTEM DESIGN & COMISSIONING: Equipment Compatibility Critical for Success

The new Recycled Water/UF membrane system was designed with 200 micron mesh pre-strainers for protection of the UF membranes. Prefiltration ahead of UF membranes prolongs the life of the system; by protecting it from an excess of suspended solids.

The pre-strainers selected for the Carlsbad job had multiple mesh wire candles, and would theoretically utilize a fluid reversal mechanism for automatic backwashing.

Within two weeks of the completion of the system commissioning (October, 2016), the pre-strainers presented operational problems. The fluid reversal mechanism that was intended to clean the strainer screens did not relieve the accumulated differential pressure. The strainers had to be disassembled at that time for inspection and manual cleaning.

Disassembly of the units required a cherry picker forklift and a complete system shutdown. Start-to-finish, the maintenance intervention took approximately 3 hrs. Review of the strainers' multiple candle elements showed that the flow reversal technology was not sufficient to remove the sticky debris that characterized the plant's secondary effluent.

Once disassembled, the strainer candles had to be individually power-washed in order to resume system operation.

After the first power-wash intervention, the strainers became ineffective within a few days, differential pressure was not relieved, and the 3-hr system shutdown and manual intervention had to be repeated. The pattern continued and required that the commissioning OEM provide manual cleaning twice per week.

In November, the strainer rep was brought onsite to conduct an installation review. During the visit, the strainer rep indicated that the mechanical function of the equipment was intact, and that the faulty cleaning in the installation had to do with chemistry. The strainer company provided no further support, indicating that issues of chemistry were beyond the scope of their work.

An immediate consequence of the malfunctioning strainers was that overall system flow had to be dropped to 66% or 2/3 of normal flow. If not for this imposed flow reduction, the manual power-wash intervention would have been required daily. The ongoing consequence amounted to ~1 day per week (2 half-days) of manual service at a cost of approx. $1200/day, for a period of nine months. The cumulative cost of troubleshooting in the tens-of-thousands fell to the OEM.

PROBLEM SOLVING: Suction Scanning Filter Outperforms Candlestick Backwash Strainer

By January of 2017, plans were set in motion to run a pilot for replacement equipment to finally reject the failed strainers.

The Encina Wastewater Authority needed a lasting solution to the equipment failure of the rejected strainers.

In February at the AWWA Membrane Technology Association conference of 2017 in Long Beach, CA the OEM responsible for the Carlsbad UF System became acquainted with Forsta technology. Forsta engineers learned of the problems encountered at the Carlsbad facility, and were confident they could provide equipment that would hold up to the operating conditions and provide reliable long-term service.

After consultation, the OEM brought on Forsta to assist in conducting a 3-month pilot system to verify the efficacy of Forsta's design to solve the problems encountered with the rejected strainers. Understandably, the city wanted reliable pilot results before approving selection of replacement equipment. Of particular concern was the sticky material that had clung to the original strainer candle elements.

The pilot, which began in April of 2017 was designed to handle ~100gpm of the secondary effluent with a 200 micron mesh screen. Pilot data included; time for the filter to accumulate differential pressure, number of total backwashes in a given period, and the ability of the backwash to fully relieve differential pressure.

3-months of backwash monitoring validated Forsta's design & technology for the scaled up version. During the pilot monitoring period, differential pressure was consistently relieved by the automatic backwash sequence, and suction scanning reliably removed all visible debris for ~800 consecutive backwashes.

One other technology was under consideration during the pilot phase. It was rejected in favor of the Forsta model, due to lack of performance during the pilot, painted carbon steel construction vs. the stainless construction of the Forsta model, and very lengthy lead times resulting from overseas manufacturing.

Installation and start-up were conducted with the full-scale Forsta suction scanners in July of 2017.

Forsta spent the next few months monitoring the installation closely with the OEM and onsite operations staff. Forsta's design theory – simplicity – allows any technical issues that arise to be addressed in an efficient and methodical manner. Based on the performance of the pilot, Forsta engineers knew, that once optimized to the conditions, the full-scale units would solve the crippling issues of the previously failed strainers.

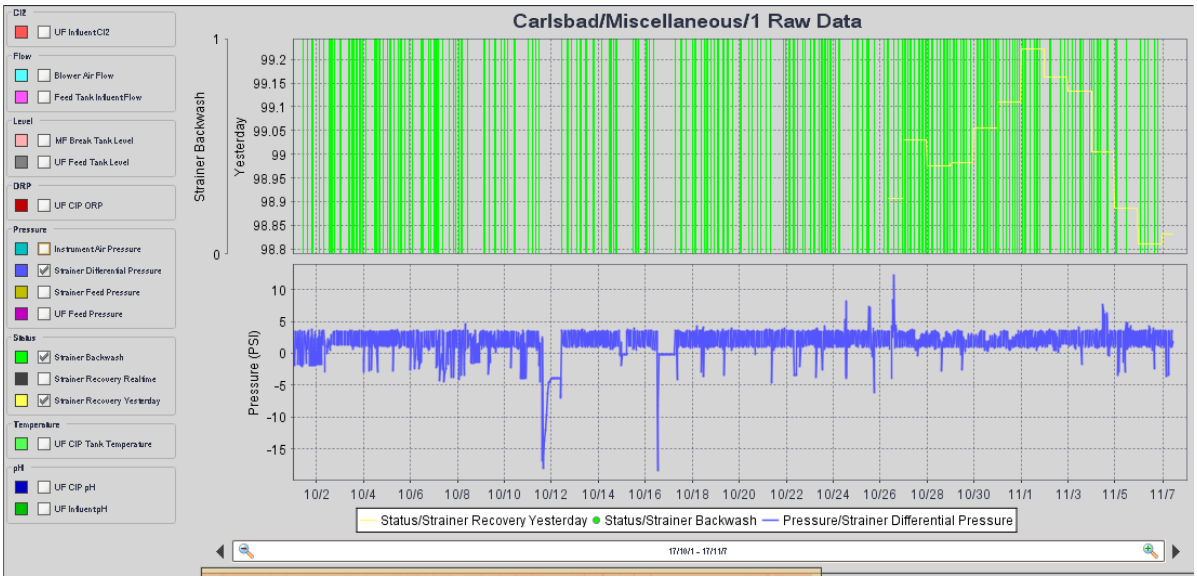
The secondary clarifiers which feed the trains to the UF system at the Carlsbad facility are open to the air, and as such accumulate debris from the marine environment. The marine debris and the treatment minerals used in the process stream caused some unforeseen issues with the scaled-up cleaning mechanism and piston interface.

When the issues presented themselves, Forsta provided the OEM with a hands-on material adjustment phase, as part of the standard installation optimization protocol. Forsta prides itself on problem solving and making sure that all equipment is set up for success in its environment.

In order to ensure proper and consistent piston function, Forsta engineers introduced a glycol dispenser tank to consistently lubricate the movement of the piston and guarantee that treatment chemicals would not disrupt the mechanical operation of the filters.

After the final material adjustments were made to the full-scale installation, equipment was monitored for a 30-day trial period starting 10/2/17. During the trial period, the bar for performance criteria was set at a 98% minimum recovery rate. The Forsta equipment exceeded the already stringent expectation by demonstrating a 99.9% recovery rate, and a consistent backwash interval of approximately 1x every 45 mins. The cleaning mechanism reliably relieved the differential pressure.

Based on successful operation over a 30-day period, the operators were able to establish a 1x per month routine check of glycol levels on the piston tanks. The strainers passed the 30-day performance test, and equipment has performed consistently ever since (~7 months). The UF system has been able to function at 100% flow capacity and the strainer replacement project has been deemed a success by the OEM and the City of Carlsbad.



From the point of the final optimizations, Forsta's self-cleaning filters have operated without issue ever since (7+ months). The UF system is now running at 100% capacity, and the automatic backwash consistently relieves differential pressure.

CONCLUSIONS: Equipment Selection and Manufacturer Support Bear Greatest Weight

Candlestick backwash strainers proved to be a poor fit for secondary effluent filtration. At the Carlsbad Water Reclamation Facility, when the candlestick strainer manufacturer was contacted for support to troubleshoot failing equipment, no solutions were provided.

In contrast, Forsta Filters provided self-cleaning suction scanners capable of consistent and reliable operation in the conditions presented by the secondary effluent. Forsta demonstrated the reliability of its technology for secondary effluent filtration applications, and the commitment of its engineers to make any system calibrations required to optimize the filters to the environment

As seen in *Water & Water Wastes Digest* January 2019 issue:

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