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Plant Operations & Training
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Recent or major fixed film projects related to trickling filter media, process evaluation, plant design or training are briefly described below:

Filter Media Evaluation or Replacement Projects

1. **TF Media Assessment and Operator Training**, Everett, WA. The Everett Wastewater Pollution Control Facility (EWPCF) typically treats 20 mgd using secondary treatment consisting of an unusual mix of TF solids contact and natural/aerate lagoons. Two of the TFs had media that were in service for 26 years. Assisted Operations staff in the excavation and assessment of the aged media. The investigation showed the aged media was constructed using forming processes which produced stronger media than currently available today (at comparable sheet thickness). Unique service conditions and the use of thin plastic sheets resulted in an estimated remaining life for the aged media of less than 5 years. Services included conducting workshops for operation and CEU awards for attendees.

2. **TF Media Assessment and Operator Training,** Mt. View Sanitary District, Martinez, CA. Analyzed operating data for the 1.2 mgd two-stage rock trickling filter followed by plastic media nitrifying trickling filter. Conducted a site visit with two interactive presentations. The last presentation included results of data analysis and operational review. A second project included assistance in excavation of plastic trickling filter media, media testing and estimation of remaining useful life of the trickling filter media. As an outcome of the investigation the District has concluded that the plastic TF media, although nearly 30 years old, does not need to be replaced in the near future.

3. **System Assessment and Operation Advice** Estacada WWTP, Estacada, OR: Other engineers upgraded the existing 0.5 mgd trickling filter solids contact facility to achieve nitrification by adding a new nitrifying trickling filter (NTF) containing plastic filter media. When the new NTF failed to perform as expected, our services were retained to work with City staff. Services included an analysis of the two-stage system with a focus on nitrification. In concert with City Operations, our services have resulted in changes in pumping, flow distribution and in system monitoring. Work continues to improve performance of the NTF and maximize use of existing facilities.

4. **TF Media Evaluation,** Annacis Island WWTP, **V**ancouver, BC: Conducted an onsite investigation and gathered information to assess the remaining useful life of plastic trickling filter media. The trickling filter solids contact plant has treated over 100 mgd for nearly two decades. Services included gathering data on the trickling filter media and comparing compression curves on new and used media. It was determined that the media may have lost from 20 to 30 percent of its original strength. Consideration is being given to developing a replacement plan for the aged media. The plan will provide a staged approach for replacing modules in four 170 ft diameter trickling filters with media that is 20 feet deep.

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5. **Trickling Filter Condition Assessment,** Honouliuli WWTP, Ewa Beach: Two 100 ft diameter trickling filters (TF) contained filter media that had been in service for 20 years, which is the minimum expected life for plastic media. Services including directing the removal of modules and overseeing both onsite and laboratory testing to assess media service life. Work also including a survey of the underdrain system, as well as an evaluation of the distribution and pumping system associated with the TFs.

6. **Replacement of Trickling Filter Media,** Westside WWTP, Bremerton, WA: Assisted the City in replacing TF media and returning a roughing filter to service after having been shutdown for 20 years. John worked directly for the City for three evaluation/study projects and then as a subconsultant to a local engineering firm during construction and startup of the restored and improved roughing filter activated sludge system.

7. **Investigation of Collapsed Filter Media,** Food Processor, Ontario, OR: A forensic investigation was conducted on collapsed trickling filter media that had been in service for less than two weeks. The study required knowledge of the food processing industry as well as a knowledge of plastic materials and their application as modules for fixed film reactors. Findings were that the filter media geometry and an extremely high solids load to the TF's led to premature plugging followed by a complete collapse.

8. **TF Media Specifications,** Lulu Island WWTP**,** Greater Vancouver Regional District, Vancouver, BC: Reviewed engineering drawings, specifications and materials choices for the construction of a new 84-foot diameter plastic media trickling filter. Provided opinions and recommendations on media type and specification.

9. **Investigation of 2003 Collapse**, Blue River WWTP, City of Kansas City, MO: Retained to investigate partial TF media that collapsed after 4 years of service. Services included oversight of temperature monitoring on a 150-foot diameter plastic media trickling filter. Established in situ tests to determine heat buildup and develop strategies to avoid media problems upon shutdown.

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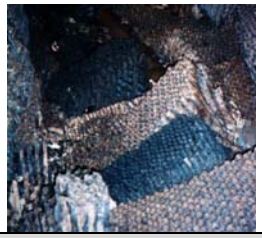
10. **Investigation of TF Media Collapse,** Littleton, CO: When the TF media collapsed after 5 years of serve, our we were retained to investigate and report on the collapsed roughing filter. Problems were identified with the specification of TF media and the supply of media which had sheets which were too thin.

11. **Investigation of 1991 Media Collapse,** Kansas City, MO: Retained to investigate full TF media collapsed after only 3 years of service. Investigation of structural failure of 4 large trickling filters including commenting and recommending changes in design practices.



Process Evaluation or Planning Projects

12. **Analysis of Combined TF & Activated Sludge,** Salt Lake City WRF, Salt Lake City, UT: As a subconsultant, the services included study at a 56 mgd combined trickling filter and activated sludge facility. Trickling filter media included both rock and plastic media. An outcome of the analysis was an understanding of the interactions of the activated sludge and various fixed film reactors. We were able to remove a plug of plastic trickling filter media and make observation on the effects of flow distribution (dosing rates) on process performance.

13. **Evaluation of Upgrade Alternatives,** The South Bay System Authority, Redwood City, CA: Analyzed energy impacts and various process and equipment changes at 24 mgd combined roughing filter and activated sludge plant. Alternatives ranged from replacing filter media to the use of new high-speed air blowers and fine bubble diffusers. Deliverables included graphical comparisons of total system energy demand and lifecycle costs.

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14. **Process Evaluation & Upgrade of Rock Media TF,** Beale Air Force Base, Yuba City, CA: Evaluation of modernizing a 1.5 mgd rock trickling filter plant to meet effluent reuse standards (CA Title 22) and stringent receiving stream standards. Issues included meeting new turbidity and stringent disinfection limits. The plant was later upgraded to a hybrid trickling filter solids contact facility with denitrification in the sludge reaeration flow stream.

15. **Process Analysis,** City of Salmon Arm, British Columbia, Canada: Evaluation and assessment of a 1.2 mgd combined fixed-film activated sludge plant. Unusual aspects include the analysis of anaerobic and anoxic biological selectors used to achieve biological phosphorus removal. The impact of autothermic aerobic digestion (ATAD) and a rotary drum thickener was also considered.

16. **Process Evaluation,** City of Elko, NV: Process and plant operation evaluation at a 2.7 mgd combined plastic media trickling filter followed by rotating biological contactor plant. In addition to a written report, operator training and a 1-day workshop was provided.

17. **Process Evaluation,** Meadowlark WWTP, Vallecitos Water District, CA: Evaluation and analysis of an existing 3.0 mgd rotating biological contactor plant. Recommended upgrade included converting to a combined plastic media trickling filter followed by activated sludge.

18. **Troubleshooting Trickling Filter,** City of Hayward, CA: Study of industrial impacts and on 13 mgd trickling filter plant including finding the cause of heavy filamentous growth on biofilter. The outcome was changes in industrial pretreatment and waste management associated with a dairy related industry.

Plant Design and Training Projects

19. **System Evaluation and Operator Training,** Tolleson WWTP, Tolleson, AZ: Retained to evaluate the 6 mgd three stage roughing filter followed by trickling filter solids contact facility. An unusual aspect of this project was the defining of nitrification, denitrification and sBOD capacity at various stages of treatment. Services included a two-day interactive workshop with plant operations and also a final project memorandum.

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20. **Process Support – Design Build,** MCB Camp Pendleton, Oceanside, CA: Supported Naval Facilities Engineering Command design/build contractors in the rehabilitation of a 0.35 mgd trickling filter. Rehabilitation work included replacing rock filter media with plastic modules and a hydraulically driven distributor with a mechanical drive. John's services included review of contractors submittals and evaluation of both filter media strength/type and rotary distributor flushing.

21. **Process Design, Anaerobic Fluidized Bed Reactor,** The Port of Portland, Portland, OR: Lead process engineer for evaluating treatment high strength (10,000 mg/L BOD) runoff from the deicing of airplanes. Unique challenges included the startup of treatment facilities in cold weather months and infrequent/variable load conditions. John's work resulted in the design of a 200 gpm anaerobic fluidized bed reactor (AFBR) system.

22. **Upgrade of Trickling Filter Solids Contact Facility,** Apra Harbor WWTP, US Naval Base, Guam: Lead process engineer for a Department of Navy project on the repair and upgrade of a 4.3 mgd trickling filter solids contact plant serving a Navy base in Guam. John worked closely with the design/build team to develop specifications and engineering drawings to rehabilitate the aeration blower system, replace trickling filter media and upgrade solid contact reactors.

23. **Pretreatment of Fertilizer Wastewater,** Port of Sacramento, CA: Process and facility design of a 0.25 mgd treatment system for stormwater runoff from a fertilizer loading area. Installed was a plastic media trickling filter which pre-treats runoff prior to polishing in a wetlands.

24. **Trickling Filter Solids Contact Design/Startup**, Waianae, HI: Services as a subconsultant included planning the upgrade of the 5.2 mgd Waianae WWTP from a primary treatment system only to one with full secondary treatment. Major new facilities integrated into the existing WWTP included new trickling filters, solids contact basins, solids reaeration tanks, final clarifiers, sludge thickening and dewatering facilities.

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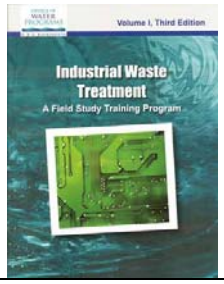
25. **Corrective Action Plan,** City of Tillamook, OR: Completion of a study, design and construction of a corrective action plan (CAP) ordered by the State of Oregon. Operational and facility changes were implemented to improve plant performance.

26. **Operator Training,** Sacramento State, CA: Authored chapter of training manual for treating industrial waste with fixed film reactors including trickling filters and RBC's (re: Ken Kerri, Professor Emeritus, Civil Engineer).



27. **Process Development and Plant Design,** The City of Turlock Regional Wastewater Reclamation Facility, City of Turlock, CA: Turlock's RWRF received approximately 8 mgd of combined domestic and industrial wastewater which resulted in treatability issues. John conducted onsite pilot studies which eventually led to the selection of a two-stage roughing filter followed by activated sludge system. After working with the City to select a suitable process, John led the engineering team in the design of the new secondary treatment portion of the facility.

in addition to the projects described above, services on fixed film reactors were provided at these locations:

Benicia, CA
Caldwell, ID
Casper, WY
Charlotte, NC
Easton, PA
Elizabethtown, KY
Frankfort, IN
Hermiston, OR
Hillsboro, OR
Hood River, OR
Jamestown, NY
Koror, Palau
Little Rock, AR
Lompoc, CA
Marysville, CA
Montego Bay, Jamaica
Muscatine, IA
Omaha, NE
Roseburg, OR
Salem, OR
San Jose, CA
Tafila, Jordan
Treasure Island, CA
Watsonville, CA
Winlock, WA
Winston, OR
Woodburn, OR