

The Treatment of Wastewater for Tourism Facilities



Overview

- Tourism & Wastewater: Needs & Challenges
- Overview of Sewage Treatment Solutions
- AdvanTex[®] Treatment
- Case Studies

Orenco History & Background

- Privately Held Company Founded in 1981
- Headquartered in Sutherlin, Oregon USA
- Designer and Manufacturer of Award-Winning Wastewater Products
 - ~ More than 100 Distributors and Dealers Located Globally
 - ~ Nearly 400 Employees, 12% with Engineering/Science Degrees
 - ~ Installations in all 50 US States & More Than 70 Countries Worldwide
- Specialist in Innovative Wastewater Treatment & Collection Technology for Onsite & Decentralized Markets



Types of Tourism Facilities with Wastewater Needs

- Hotels & Resorts
- Condominiums
- Golf Courses
- Luxury Villas & Lodges
- National, State, Regional Parks



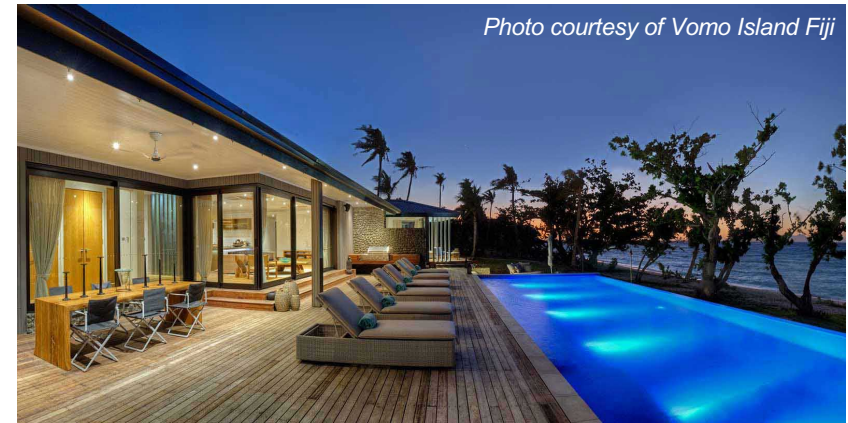
Upscale Hotel - Greece



Luxury Resort - Panama

Types of Tourism Facilities with Wastewater Needs

- Campgrounds
- Eco Retreats
- RV parks
- Retirement Communities
- Private Islands



Island Resort - Fiji



Camp Retreat – British Columbia, Canada

Key Factors Driving Long Term Growth in Tourism*

- Population Growth
- Increasing Wealth
- Rising Global Middle Class
- Growth of Destination & Sustainable Tourism
- Transportation Making Global Travel Easier than Ever
- Political Stability, Lifting of Sanctions
- Increased Global Connectivity

* *United Nations World Tourism Organization (UNWTO.org)*

Critical Needs for Tourism Facilities

- Guest Experience
 - Keep Guests Safe & Healthy
 - Reviews & Ratings Key
- Environmental Conservation
- Open for Business
 - High season and high occupancy
- Profitability
 - Bottom Line



Resort Hotel - Greece

Wastewater Characteristics & Challenges

- Variable Flow & Seasonality
- Remote “Off Grid” Location
- High Water Usage – Often Times in Water Scarce Locations
- Multiple Wastewater Sources
 - Restaurants/kitchen, laundry, guestrooms, bars, etc.
- Stringent Effluent Requirements
 - Coastlines, natural reserves, protected zones, etc.
- Harsh Weather Resiliency
- Many Lack Fulltime Wastewater Treatment Operators

Major Goals & Objectives

- Invisible to Guests & Visitors
 - Zero odors
 - No noises
 - Don't want to see it!
- Dependable & Reliable
- Simplicity (Operation & Maintenance)
- Low Energy & Cost of Ownership
- Reuse Potential
 - Irrigation, dust control / cleaning, greywater, etc.



Underground Installation in Greece

Water Recycle & Reuse

- Why Recycle Treated Effluent?
 - The Technology Exists and We Can!
 - High Cost of Water in Many Locations
 - Heavy Usage of Water / Preserve for Critical Uses
 - Drinking Water
 - Showers and Washing
 - Pools and Spas
- Reliable Treatment Makes Effluent Reuse Convenient For:
 - Secondary Treatment: Landscape irrigation
 - Tertiary Treatment: Non-potable reuse for flushing toilets, water features, wash down applications, golf course irrigation, etc.

Comparison of Two Treatment Processes

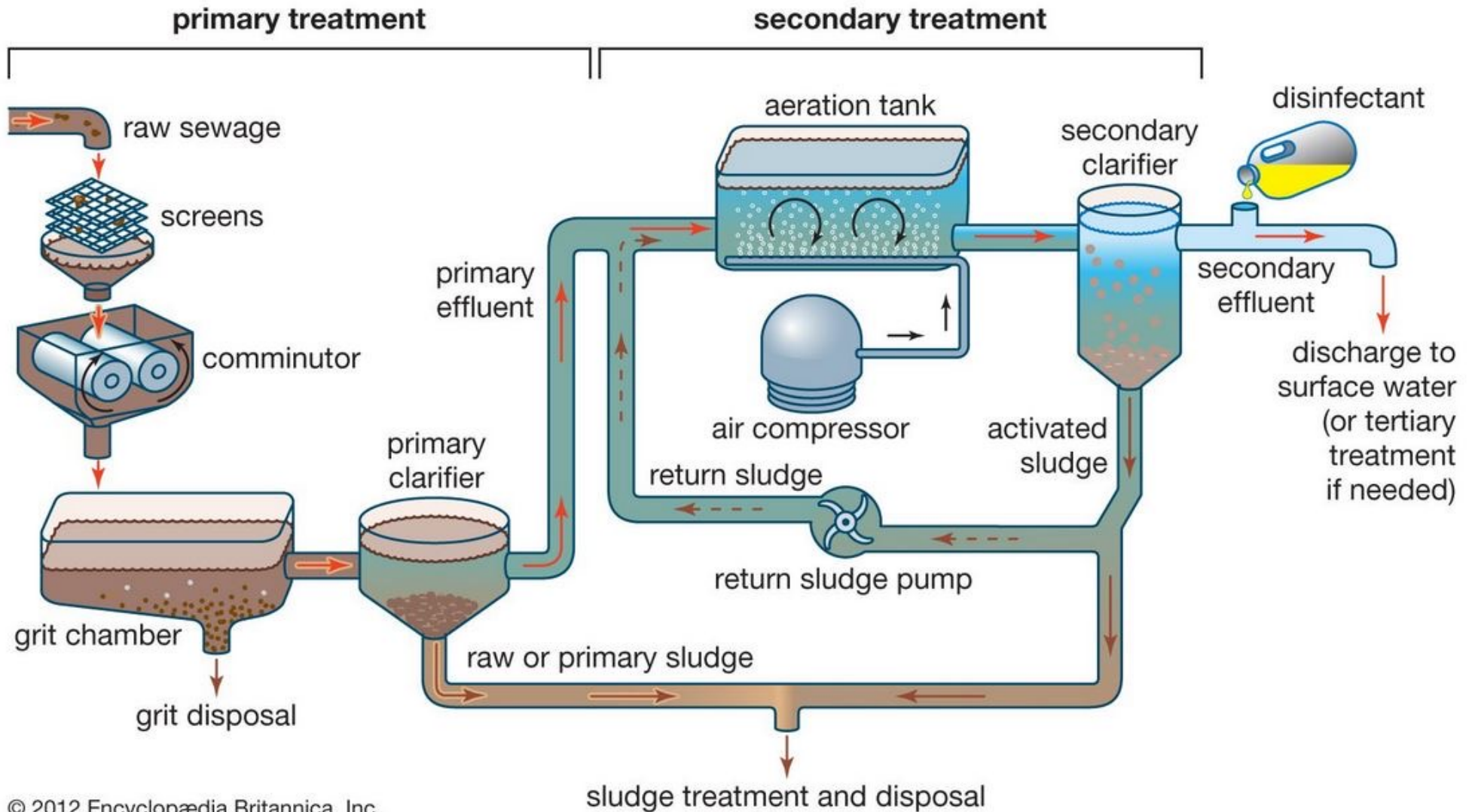
Suspended Growth (Activated Sludge)



Attached Growth (Packed Bed Filters)



Standard Activated Sludge Process



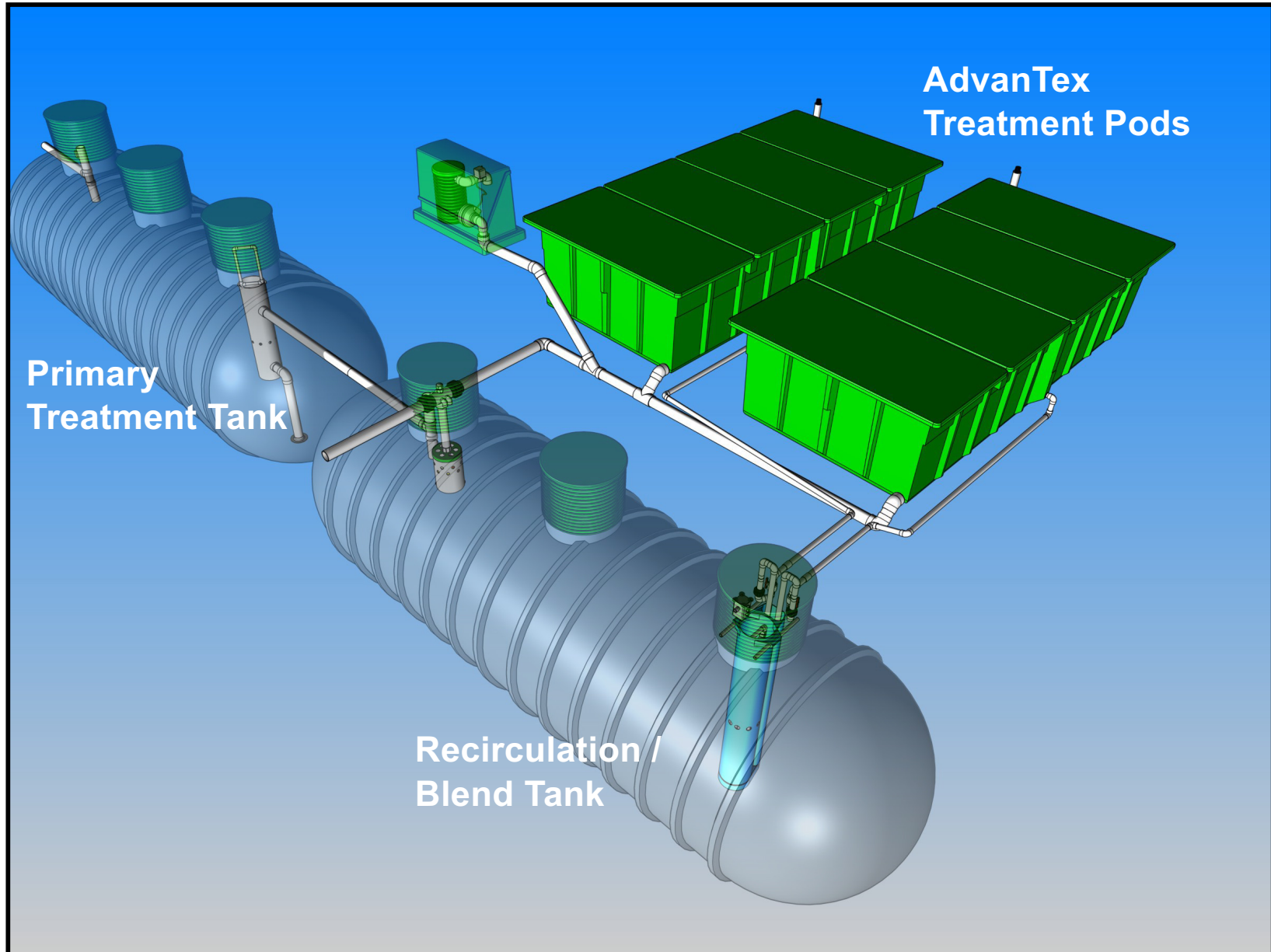
Activated Sludge Process Operation

- Aeration chamber
 - Mixed liquor monitoring
 - Correct balance of microorganisms to treat influent
 - Sludge age monitoring
- Return activated sludge (RAS)
 - Concentration of sludge returned to aeration chamber
- Waste activated sludge (WAS)
 - Wasted sludge to discharge
 - Dewatering, stabilizing, disposal

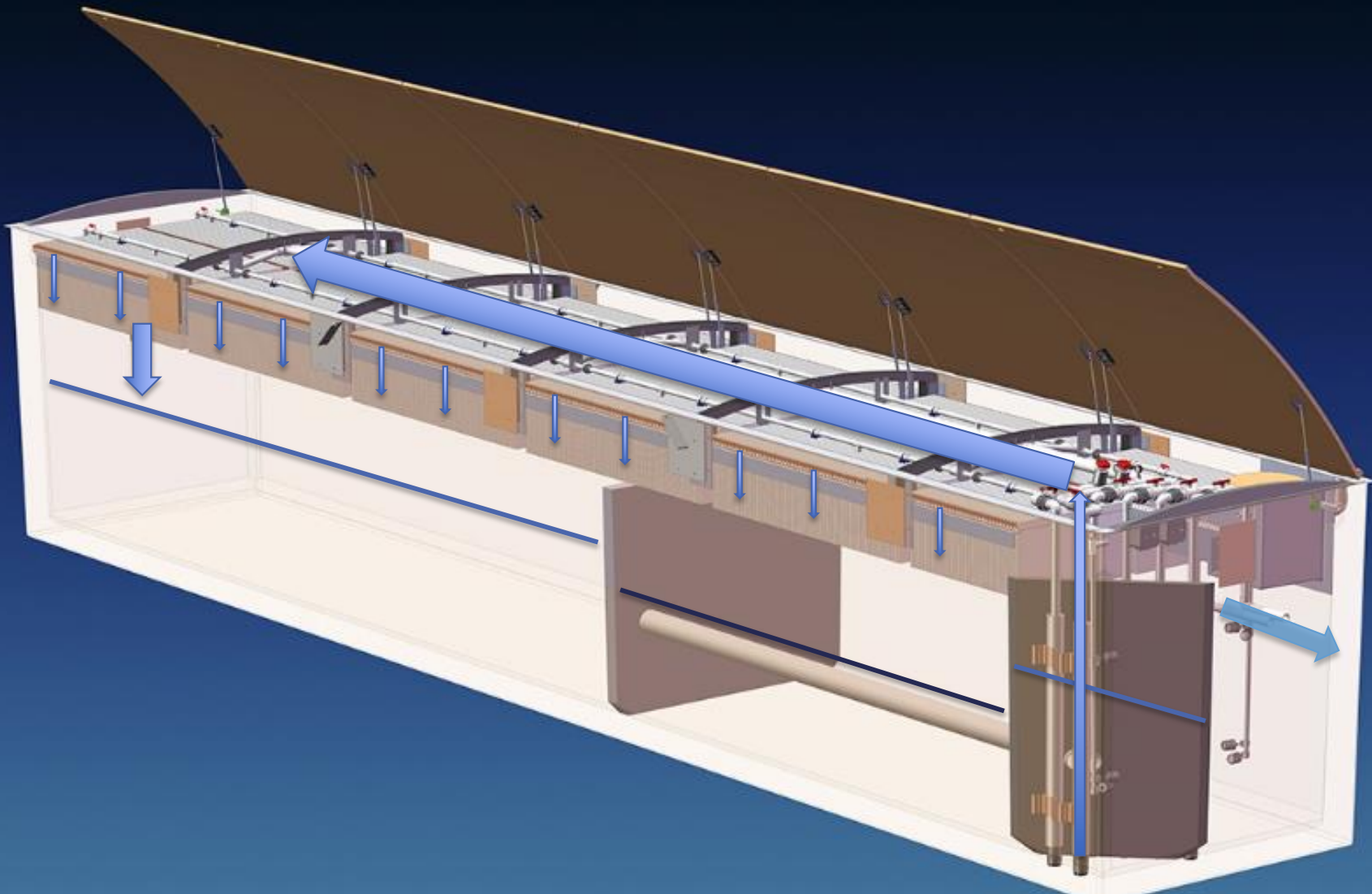
Packed Bed Filter – Attached Growth Process

- Highly stable, reliable (difficult to upset)
- Low power requirements (uses less than 3kW per 1000 treated gallons of domestic waste)
- Uses fixed film media
- Minimal operator intervention
- Operates in an unsaturated condition (not submerged)
- Employs intermittent dosing
- Uses filtration and biological/chemical reduction
- Produces a net reduction in cellular mass
 - Little or no sloughing
 - Minimal solids accumulation

AdvanTex[®] AX-100 with Primary Treatment

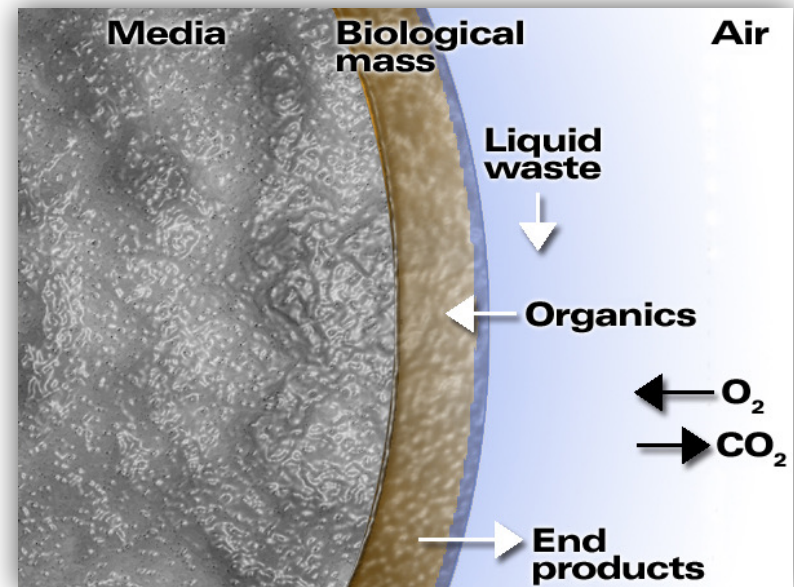
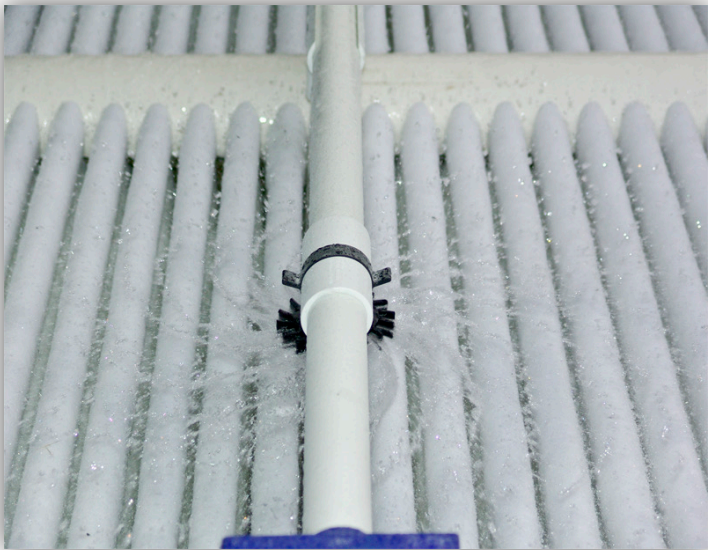


AdvanTex AX Max



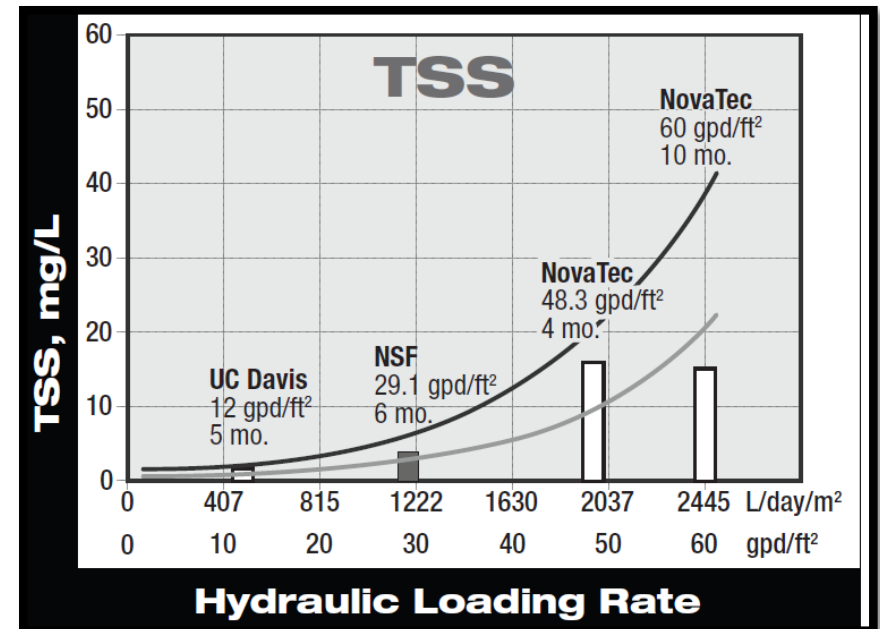
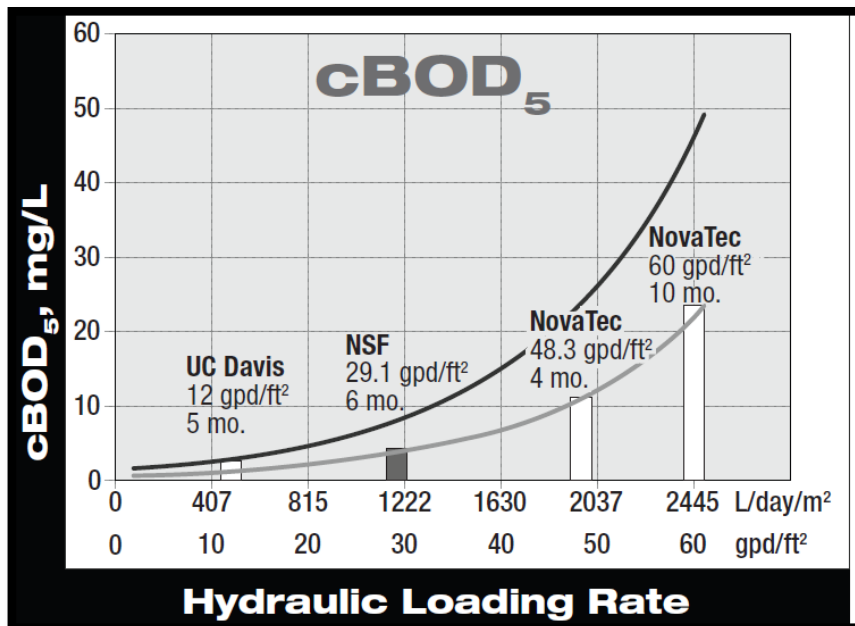
Attached Growth Treatment Process

- Aerobic microbes attach and grow on media
- Wastewater flows across a thin biological film created by microbes
- Microbes extract and digest soluble organic matter from the wastewater



Textile Packed Bed Filter Performance

- Treats cBOD₅ and TSS to 10 mg/L or better at proper loading rates
- Performance increases as organic loading decreases
- Validated by independent 3rd party testing



*Effluent Quality vs. Hydraulic Loading Rates
Third Party, NSF/ANSI Standard 40 Testing*

AdvanTex[®] Treatment Benefits

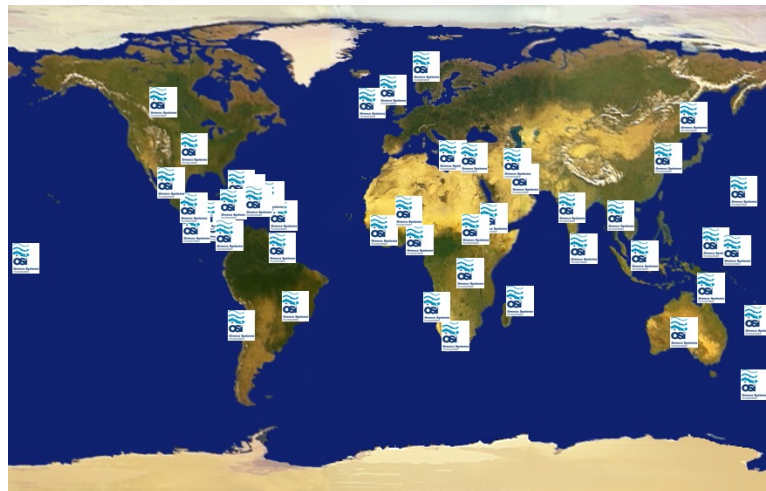
- Meets Strict Effluent Requirements
- Design Able to Handle Variable Flows
- Low & Simple O&M
 - Doesn't require highly skilled operator
- Consistent Results
- Low Energy Consumption
- Further Treatment for Non-Potable Reuse



Tourism Park - Australia

AdvanTex[®] Treatment Benefits

- Minimal Noise and Odor
- Blends Nicely in Landscape (Visual)
- Resilient to Harsh Environments
- Quick Response Time for Natural Disasters
- Modular with Ability to Easily Expand
- Proven Global Experience and Wide Spectrum of References



Advanced Controls & Monitoring

- Telemetry Control Panels communicate status, alarms, and control information through hardwired or wireless connection
- Ability to perform onsite or remotely:
 - Advanced programming to automatically adjust operation based on flows
 - Monitoring of system performance
 - Data Logging
 - Automatic call-outs of alarm conditions (no bother to guests)
- Manufacturer remote support for troubleshooting
- Ease of access through graphic interface means operator simplicity

Technology Comparison for Tourism Facilities

| Major Goals & Challenges | AdvanTex® | Activated Sludge |
|--------------------------------------|-----------|------------------|
| Ability to Handle Flow Variability | ✓ | ? |
| Meet Stringent Effluent Requirements | ✓ | ? |
| Simple To Operate | ✓ | ? |
| Minimal Maintenance | ✓ | ? |
| Reliability | ✓ | ? |
| Energy Friendly | ✓ | ? |
| Invisible to Guests & Visitors | ✓ | ? |
| Reuse Ability | ✓ | ? |
| Impact on Bottomline Profitability | ✓ | ? |

Guest Experience



Visual Impact



Remote Resort – Belize

What Lies Underneath



Remote Resort – Belize

Visual Impact



Island Resort – Panama

Proper Management is Critical

- **All Systems Need Oversight**

- Installation
- Operation
- Maintenance
- Performance Testing
- Enforcement



Asset Management Important for Success!

Odor Concerns



Hotel – South Pacific

Risk Concerns



Case Studies and Examples

Mirragio Thermal Spa Resort, Greece

- 300-Room Luxury Hotel with:
 - Marina
 - 4 Restaurants
 - 6 Bars
- Design Flow: 63,000 gpd (240 m³/d)
- 22 x AdvanTex[®] AX100 Units
- Following Sand Filter and Chlorine Disinfection, Effluent is Reused for Landscape Irrigation
- Effluent Quality:
 - 8.7 mg/L BOD₅
 - less than 1.0 mg/L TSS
 - 14.1 mg/L TN



Daniels Summit Lodge, Utah, USA

- Mountain Resort in the Uinta National Forest where flows fluctuate from 500 gpd (1.9 m³/d) to 17,875 gpd (67.7 m³/d)
- 6 x AdvanTex[®] AX100 Units
- Effluent is Drip Disposal
- Effluent Quality:
 - 11.1 mg/L BOD₅
 - 7.1 TSS
 - 4.0 mg/L TKN



Emirates Wolgan Valley Resort, Australia

- Luxury Resort located between two national parks
 - Goal is to be “Australia’s most environmentally responsible tourist destination”
- Design Flow: 26,417 gpd (100 m³/d)
- 12 x AdvanTex[®] AX100 Units
- Following UV Disinfection, Effluent is Reused to Irrigate Pastures and Gardens on Property



Photo courtesy of Emirates Wolgan Valley Resort & Spa

Sugar Beach, A Viceroy Resort, St. Lucia

- WWTP Destroyed by Hurricane Tomas in October 2010
 - Needed emergency solution designed, built, shipped, installed and functioning before busy Christmas season
- Design Flow:
 - Temporary: 10,000 gpd (37.9 m³/d)
 - Permanent: 75,000 gpd (283.9 m³/d)
- 2 x Orenco AX-Mobile units
 - One for Temporary; one for Permanent Solutions
- Following UV Disinfection, Effluent is Discharged to the Ocean



Glendhu Bay Holiday Park, New Zealand

- Holiday Park on Scenic Bay that Includes:
 - 420 campsites
 - Lodging for 60 persons
- Design Flow: 26,400 gpd (100 m³/d)
- 5 x AdvanTex[®] AX-Max Units
- Effluent Quality:
 - 13 mg/L BOD₅
 - 11 mg/L TSS
 - 21 mg/L TN
- Following UV Disinfection, Effluent is Dispersed into Land via Subsurface Pressurized Distribution



Panama Island Resort Community



Phase 1 Treatment Facility (26,417 gpd - 100 m³/d)



Conclusions

- The Wastewater Needs of Tourist Facilities Offer Unique and Challenging Characteristics
- These Challenges Must Be Met to Maintain Positive Guest and Visitor Experience
- Various Process and Treatment Options Exist, with Different Strengths and Weaknesses that May Impact Your Profitability
- Proven Solutions Are Available and Can Be Successful When Appropriately Specified and Correctly Implemented