



# USBF™

## Upflow Sludge Blanket Filtration

Since 1995, ECOfluid has supplied over 130 wastewater treatment plants in North America. The company also offers ongoing treatment plant operations and management services to municipalities and private owners. The result of this cross reference of design, construction and operating experience is a unique wealth of knowledge and ability.



*Giving Water New Life*

**ADVANCED  
BIOLOGICAL  
WASTEWATER  
TREATMENT**

## USBF™ TECHNOLOGY SUMMARY

The patented and proprietary Upflow Sludge Blanket Filtration (USBF™) wastewater treatment process is the result of over fifty years of research, development, testing and practical experience. It is a modification of the conventional activated sludge process that incorporates an anoxic selector zone and a USBF™ filter within an integrated bioreactor.

The ensuing compact and modular system takes up significantly less space and contains very few moving parts. The result is an effective and efficient, highly affordable wastewater treatment plant with low maintenance and operating costs.



25,000GPD (100m<sup>3</sup>/d) packaged USBF™ WWTP. Located directly on a golf course, attesting to the minimal noise and non-odorous nature of the process.

The USBF™ technology has no inherent capacity limits and is used in a wide range of applications. Plants serving the residential, municipal, commercial, and industrial sectors are in successful operation worldwide.

The high efficiency of the USBF™ process paves the way to economical 'tertiary' post-treatment. Utilizing the USBF™ process followed by polishing and disinfection, ECOfluid designs, builds and operates treatment plants producing Class A or Title 22 effluent at economical capital and operating costs.



80,000GPD (300m<sup>3</sup>/d) USBF™ WWTP. Water reused for irrigation and fire suppression at nearby hotel/casino.



City of Lake Alfred, FL USBF™ WWTP - IMGD (4,000m<sup>3</sup>/d)

## UNIQUE FEATURES OF THE USBF™ TECHNOLOGY

### USBF™ filter

The USBF™ filter is a prism or cone shaped filter that introduces a substantially higher specific rate of separation than other commonly used separation techniques. Unlike conventional filters and clarifiers, the influent enters at the bottom and flows upwards. High filtration efficiency is achieved and even particles with settling velocities too low to be removed by settling alone are filtered out.

### High sludge concentration

Most traditional plants operate at low or medium sludge concentrations, typically 2,500-3,500 mg/l. USBF™ filters operate at higher sludge concentrations, typically 4,000-6,000 mg/l resulting in increased sludge age and biological efficiency.

### All processes integrated into one bioreactor

Most conventional technologies carry out processes of nitrification, denitrification, clarification and sludge stabilization in a number of dedicated vessels. The USBF™ process incorporates all of these processes within one compact bioreactor, drastically reducing the plant footprint, equipment size, and liquid handling requirements.



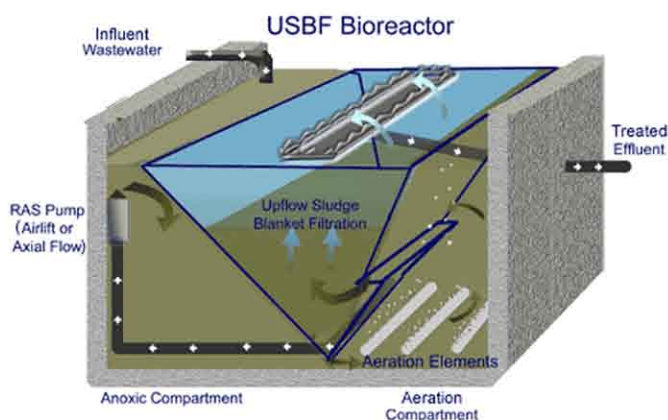
Installation of the USBF™ filter into IMGD (4,000m<sup>3</sup>/d) municipal USBF™ WWTP.

## USBF™ PROCESS

Operation of a USBF™ plant is simple and self-regulating. Wastewater enters the anoxic compartment of the bioreactor where it mixes with activated sludge recycled from the bottom of the USBF™ filter. Agitated and moved in a plug flow manner, the mixed liquor flows into the bioreactor's aerobic compartment.

After aeration, a stream of the mixed liquor enters the bottom of the sludge blanket filter. As the cross sectional area of the filter increases, the upflow velocity decreases until the activated sludge flocs become stationary, thus forming a filtering media for effluent to flow through. After separation, filtered effluent overflows into a collection trough and is discharged from the system for disposal or for polishing and disinfection (water reuse).

To complete the internal circulation loop, activated sludge collecting at the bottom of the USBF™ filter is recycled back into the bioreactor's anoxic compartment.



## USBF™ BENEFITS

### High treatment efficiency including BNR

The USBF™ process features an internal anoxic compartment for biological reduction of nitrogen and phosphorus by nitrification, denitrification and 'luxury uptake' processes.

### Alkalinity recovery and filamentous bacteria control

The integral denitrification process facilitates partial recovery of alkalinity during nitrification. As well, the anoxic selector is used to control filamentous bacteria growth within the system.

### Primary clarification not required

A proper screening facility and for larger plants, grit removal system is all that is required upstream of the bioreactors.

## USBF™ BENEFITS CONTINUED

### Hydraulic flexibility

The USBF™ filter shape facilitates superior hydraulic flexibility. The process easily accommodates high peak flows and flow swings in a self-regulating manner; the higher the flow, the higher the sludge blanket rises and the larger the filtration area becomes.

### Modular and flexible design

The USBF™ process design allows owners to stage plant development and ensures that plants can be quickly expanded if and when growth demands.

### Low operating and maintenance requirements

The compact design, minimal amount of moving parts and self-regulating hydraulics result in reduced supervision requirements, contributing to lower operating and maintenance costs.

### Reduced plant footprint

The USBF™ process incorporates all processes into one compact bioreactor which leads to a smaller plant footprint.

### No odour

Aerobic conditions throughout the bioreactor and the extended sludge age dramatically reduce or eliminate odour. USBF™ plants can be located within populated areas without any odour concerns.

### Improved sludge characteristics

Extended sludge age of 25-35 days produces less excess sludge, which is aerobically stabilized, and which is characterized by improved structure and better dewatering capability.

### Patented and proven

With literally hundreds of plants in operation worldwide, USBF™ has been proven to consistently deliver high quality treated effluent in a variety of applications.



High quality USBF™ effluent at the surface, filtered up through the sludge blanket (intentionally raised).



32,000GPD (120m<sup>3</sup>/d) decentralized USBF™ WWTP - no noise, no odour, out-of-sight. Environmentally sensitive discharge.



375,000GPD (1,400m<sup>3</sup>/d) ski resort USBF™ WWTP - highly fluctuating flows. Modular expansion (right).



32,000GPD (120m<sup>3</sup>/d) Class A+ USBF™ WWTP. Water reused for nearby aquifer recharge.

## TYPICAL APPLICATIONS

### Municipal and Domestic Wastewater

Customized and packaged USBF™ treatment plants serving municipalities, communities, subdivisions, ski resorts, shopping centers, summer resorts, golf courses, hotels, restaurants etc. are in operation worldwide.

### Water Reuse

The high treatment efficiency of the USBF™ process paves the way for efficient and economical tertiary treatment. USBF™ is increasingly and advantageously used in the design of treatment plants producing unrestricted access reclaimed water.

### Existing Plant Retrofits

The self-contained nature of the internal circulation loop and structural independence of the USBF™ filter insert make it possible that virtually any tank can be converted to a USBF™ wastewater treatment plant. Many existing plants have been retrofitted with USBF™ filters to increase treatment efficiency and/or plant capacity.

### Industrial Wastewater

Many plants treating high strength industrial wastewater including food processing plants, slaughterhouse and rendering plants, dairy plants and pulp mills have been designed and are in successful operation worldwide.



80,000GPD (300m<sup>3</sup>/d) packaged municipal USBF™ WWTP installation in Northern BC, Canada.

EFFECTIVE | EFFICIENT | ECONOMICAL



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