



Astrasand™ Continuous Backwash Filter

Water Technologies

SIEMENS

Technology & Characteristics

Municipal wastewater polishing application for ammonia, BOD, and suspended solids removal.



The ASTRASAND™ filtration system is a new and improved continuous sand filter, developed for physical-chemical and/or biological treatment of different types of water, such as process, waste, surface, cooling and ground water. The filtration process of the ASTRASAND filter is comparable to fixed bed filters in that it removes particulate material. However, its technology offers some distinct advantages. The ASTRASAND filter operates under a constant backwash mode, continuously cleaning the filter bed. This self-cleaning, continuous process allows for consistently high filtrate quality. Unlike conventional filtration with starting and stopping of backwash cycles which are susceptible to increases in flow and loading rates, the continuous wash water flow of the ASTRASAND filter is independent of the suspended solids load and the hydraulic load.

The head loss over the filter is kept at a predetermined level by either manually or automatically adjusting the sand recirculation rate. The ASTRASAND filter can be fed by gravity or by pumps.

Chemical addition, such as with methanol feed for denitrification, flocculants for P-removal, or oxidizers for manganese removal, can easily be incorporated into the ASTRASAND filter without any renovation to the basic filtration system.

The design of the ASTRASAND filter is modular and compact, enabling simple construction, quick installation, and low maintenance. All of the critical components are located internally in the filter body, creating a very small footprint. This makes the ASTRASAND filter an ideal solution for installations with extreme site restrictions, or as an add-on to existing treatment systems. The hydraulic design capacity of the ASTRASAND filter varies between three and seven gallons per minute per square foot (gpm/ft²), depending on the actual application. The centering of the airlift assembly is very critical to the uniformity of the sand circulation rate. Special assembly procedures have been developed to ensure the correct position of the airlift pipe.

There are many economical benefits related to the ASTRASAND filter. In contrast to conventional filtration, no pretreatment such as flocculation zones are necessary in situations with high suspended solids loadings. In addition, because there are no moving parts, wear and tear is minimal, and operational and maintenance costs are extremely low. Due to low air consumption demand and lack of internal pumping, energy costs are low.

Applications

Industrial wastewater application where the ASTRASAND is removing aromatic carbons out of groundwater.

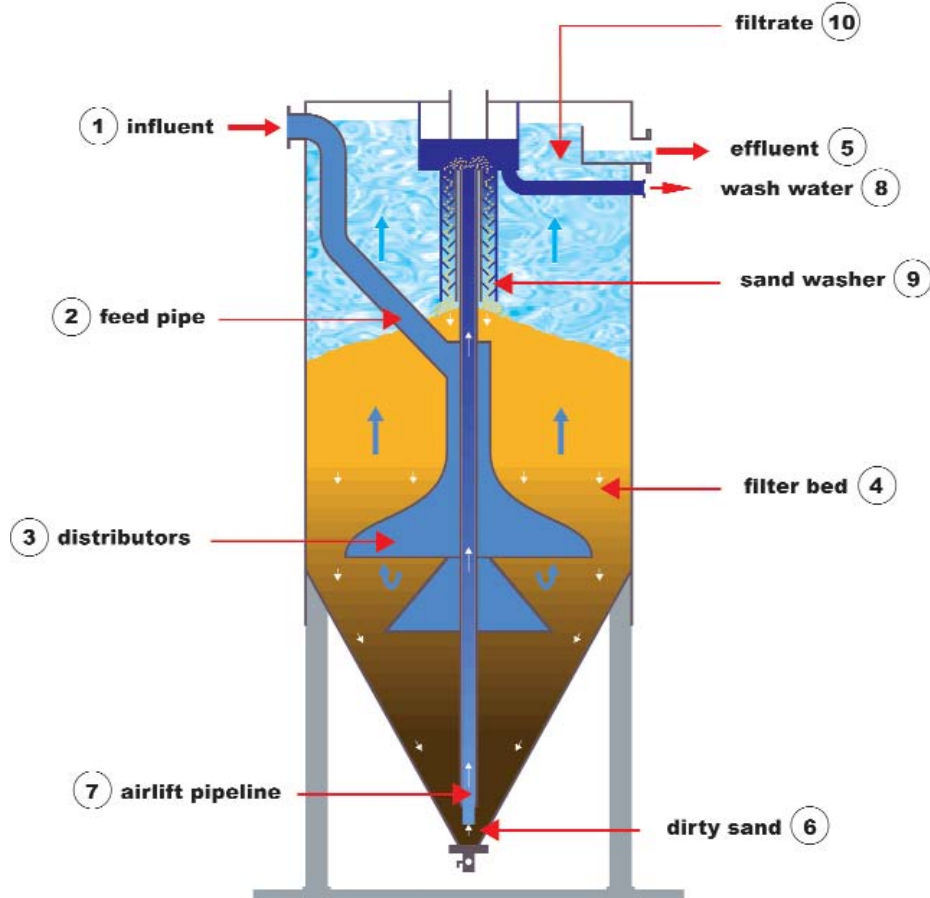


In municipal applications, the ASTRASAND filter is ideal for wastewater treatment plants needing to meet stringent discharge criteria for biochemical oxygen demand (BOD), nitrogen (TKN), phosphate (P), and suspended solids (TSS). The addition of the ASTRASAND filtration process can leave the existing infrastructure unchanged, without adding excessive capital costs.

Industrial and process water applications benefit just as well from the ASTRASAND filtration process. It has proven its effectiveness in the treatment of surface waters, ground waters, and side stream (bio)filtration for cooling water systems. The ASTRASAND filter is also effective in removing iron and manganese. Washwater or other process streams can be filtered by the ASTRASAND filter as part of an overall integrated reuse design. The ASTRASAND filter is also ideally suited for precipitation and filtration of metals.

Applications	Elements Removed
Surface Water	TSS, turbidity, color, PO ₄ -P
Ground Water	Fo, Mn, NH ₄ ⁺
Cooling Water	biofouling, TSS, turbidity
Washwater	Fe, TSS, turbidity
Wasterwater	P, TSS, NOx, heavy metals
Biofiltration	NH ₄ ⁺ , NOx, heavy metals, aromatic carbons

Operation



Water

The polluted water is transported into the filter by means of the feed pipeline (1). Water enters the filter bed (4) through the supply pipe (2) and the distributors (3). This water is filtered as it flows through the filter in an upward direction. The filtrate is discharged from the upper part of the filter (5).

Sand

The filter bed moves downward as the water flows up. Dirty sand (6) is continuously extracted from the sand bed and washed by a sand washer (9), after which it is released back on top of the filter bed (4).

Air

The sand circulation is based on the airlift principle, forcing a mixture of dirty sand and water upward through a central pipeline (7). Intensive scouring movements separate the impurities from the sand particles. At the top of the pipeline the air is released, and the dirty water is discharged (8). The sand then settles in the washer.

Sand Washer

The sand washer (9) at the top of the filtration tank washes the sand with a small amount of clean filtrate. This removes the final traces of pollutant from the sand. Flow is achieved through a difference in level between the filtrate (10) and the wash water (8).

Options

Left bottom: view of components in a concrete installation.

Left top: view of covers and ASTRAMETER probe for a concrete installation.

Right bottom: Municipal wastewater application for phosphate removal utilizing chemical addition.

Right top: Stainless steel construction ASTRASAND filters for ground water treatment at a sugar factory



Materials of Construction

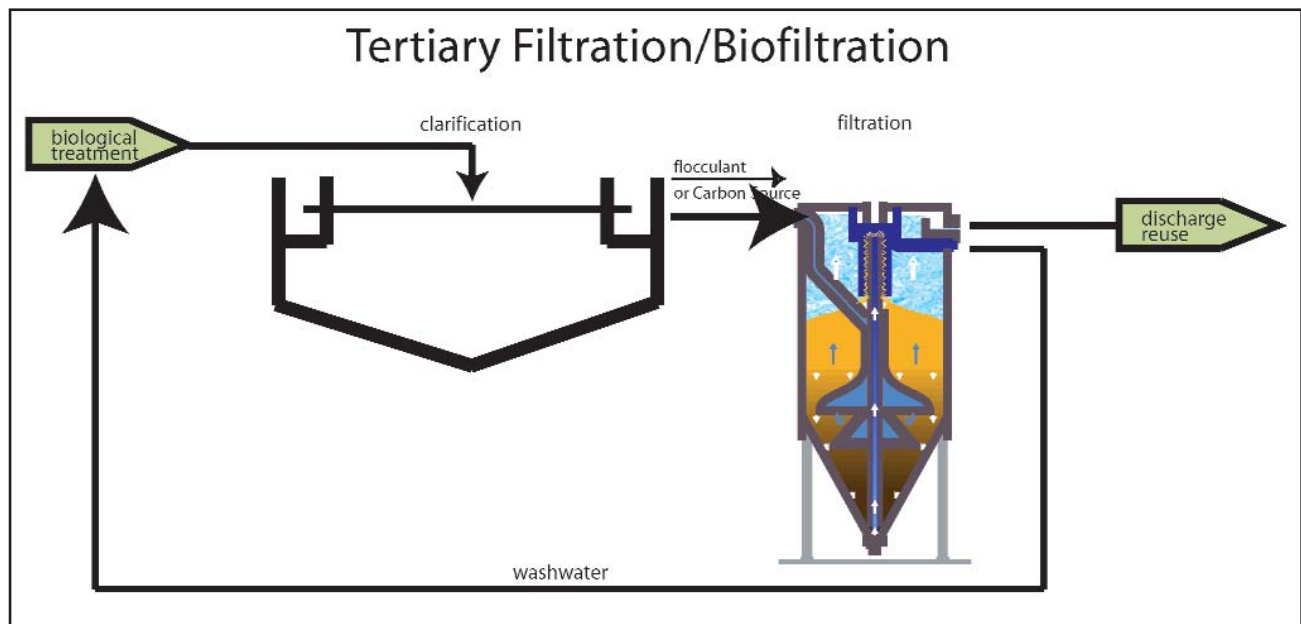
According to the customer's preference, the ASTRASAND filter can be constructed of carbon steel, stainless steel, fiberglass, or installed in concrete basins. In very large capacity installations, concrete may prove to be the more economical choice. The center airlift and washbox are vital components of the ASTRASAND filter. They are constructed of high density polyethylene (HDPE), which is more durable than other materials, such as PVC and stainless steel piping.

Process Monitoring and Regulation

The ASTRASAND filtration system has several options available that separate it from the competition.

The ASTRAMETER™ is a monitoring system that measures the sand circulation rate in multiple locations of the filter bed surface. This allows the operator to measure the uniformity of the sand circulation, thus monitoring the overall filter's efficiency.

The ASTRACONTROL™ is an advanced regulation system that actually controls the sand circulation rate by measuring the head loss, feed flow, and temperature. The ASTRACONTROL is recommended when influent conditions are highly fluctuating, when strict effluent levels are needed, and when applying biological processes.



This schematic illustrates a typical process flow for P-removal applications utilizing the addition of flocculants, as well as biofiltration with the addition of a carbon source.

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