TRICKLING FILTER CAPACITY INCREASED WITH XCELBIO

The addition of Xcelbio increased the capacity of this trickling filter treatment plant and reduced the capital expenditure requirements.

The construction of an additional biofilter and humus tank was avoided.

The following concerns are being resolved:

- Elimination of odor
- Reduction of high COD
- Increased nitrification
- Reduce sludge production.

Trickling Filters have, historically, been the work horse for the treatment of wastewater. Known for their consistent performance and reliable operation.

Trickling Filters have a number of benefits over the more popular activated sludge process such as lower energy requirements, minimal maintenance cost, lower sludge production and smaller plant footprints.

These processes are also extremely robust, very stable and simple to operate, while still producing a consistent effluent quality.

Loading Capability

Many Trickling Filters are required to achieve simultaneous carbon (COD) and ammonia removal. Nitrification can only take place when nitrifying bacteria establish in the bio-film. Normally this only occurs in the lower parts of the media once the COD has been removed

For a conventional trickling filter to achieve good ammonia removal the organic loading on the media must be lower than 250 g COD/m3.d. The depth of media is usually greater than 3 meters.

At rates between 250-750 only partial nitrification can be expected. At rates above 750 no significant nitrification can be anticipated.

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Natural solutions for man-made problems

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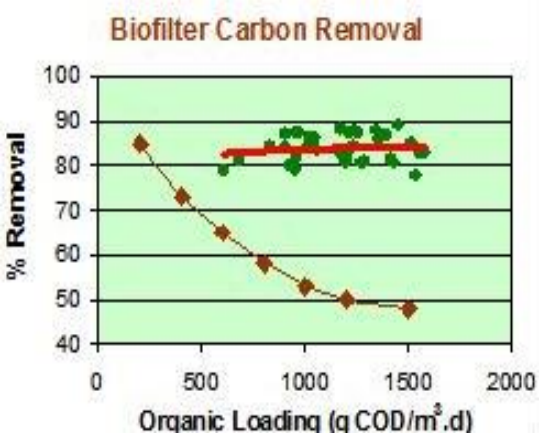
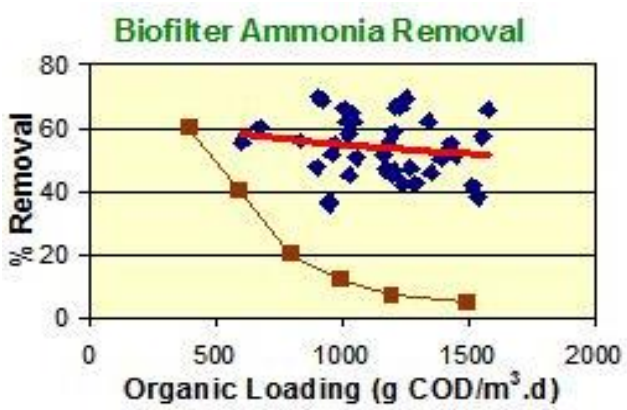
A trickling filter system originally designed for 800m3/d was treating 1400 m3/d. The plant removed only 60% of the COD with minimal nitrification. This performance is in line with expectations for rock media.

Xcelbio was introduced to increase process capability. The objectives were to improve effluent quality to within regulatory standards. The performance of the plant was compared to results obtained by a recent WRC study concerning High Rate Biological Filtration.
(www.wrc.org.za)

As can be seen from the graph,the carbon removal on the bio-filter is significantly higher than that achieved by bio-filters in the study. 85% removal is achieved at loadings over 1000 g/m3/d compared to the 50% expected. This data has been collected over 4 years of operation.

At these high loadings only 10% ammonia removal would be expected, and that mainly for bacterial cell growth. Almost 60% nitrification is consistently achieved, on a bio-filter which is only 2,2m deep.





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Due to the high hydraulic load no recycling of humus tank effluent is done. Despite this the nitrate concentrations in the humus tank effluent is only 75% of expectations based on ammonia removed.

Increased Capacity

From the research study, confirmed by previous analytical results prior to the implementation of Xcelbio, the plant could only be expected to remove 50% of the COD and 10% of the ammonia at the current loadings.

With the implementation of Xcelbio the process performance increased dramatically. Although the flow has increased by 29% to 1800 m3/d the effluent quality has not deteriorated. The stability and reliability of the process is demonstrated by the flat curve over a wide range of organic loadings.

Not only is the performance high but the performance curve is flat, consequently the system can perform well under high and shock load conditions.

To achieve similar ammonia removals the process must only be loaded to 500 g COD/m3.d. This relates to at least a 100% increase in process capacity.

Under these high organic loadings, odors are normally encountered due to anaerobic conditions prevailing in the filter. Due to the incorporation of Xcelbio (Crenarchaeota) no odors are present.

Sludge

It has been demonstrated that the Xcelbio process reduced the sludge production by approximately 60%.

Primary clarifiers are normally de-sludged on at least a daily basis, which was the case at this plant. Since the Xcelbio was introduced into the primary clarifier the settled sludge is digested with a substantial reduction in primary sludge. De-sludging only happens every 4 days.
Doubling of plant capacity, reduction of sludge by more than half and optimal use of existing equipment –

Great natural biological solutions

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