

Cryptosporidium parasite protection for our drinking water by AFM filtration

IFTS, Institut de la Filtration et des Techniques séparatives in France 2016 evaluated the performance of AFM grade 0 for the removal of 4 micron particles from water.

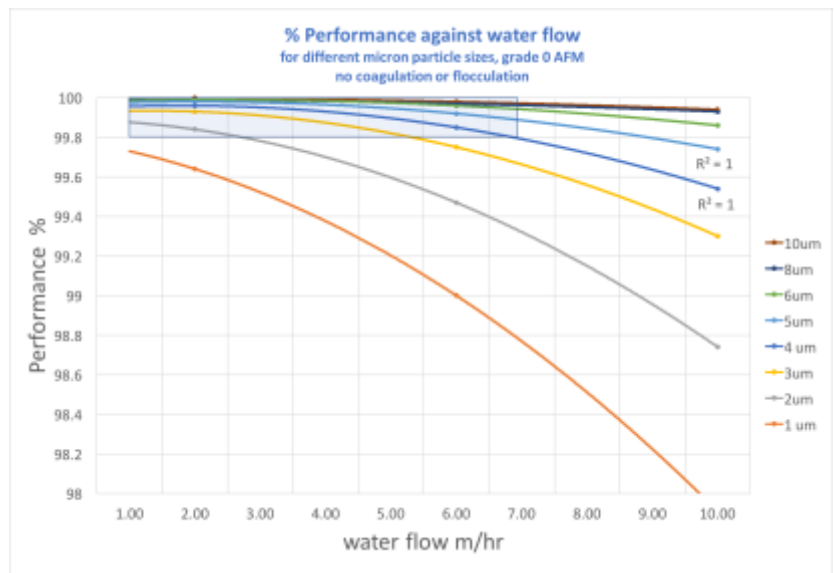
The results confirmed that AFM grade 0 would provide a log3 reduction of 4 micron particles (Crypto oocysts analogue) at a water flow velocity of 5m/hr. At a water flow velocity of 7m/hr performance was slight reduced to log 2.7. The tests were performed with no coagulation or flocculation with a bed depth of 900mm of grade 0 AFM (Activated filter media)



Cryptosporidium is a parasite which forms an oocyst measuring 5 microns in diameter. It is the most common water borne disease in Europe and North America. Worldwide it is responsible for over 1 billion cases of infection every year. The parasitic infection is life threatening to the elderly, infirm, immune suppressed and for children, especially in developing countries. Cryptosporidium is considered as a neglected disease by WHO, L. Savioli et al 2006, and may be responsible for as many as 1 in 1000 mortalities, based on the Milwaukee out-break of 1993

Sand filters combined with good flocculation using polymers will remove crypto oocysts, but the process is not secure. Biodynamic instability leads to transient wormhole channelling of filters 0.1% of the time. Sand filter instability may account for up to 5% of all disease in temperate countries and 80% in tropical and developing countries.

UVC irradiation of filtered water is an option which is being advocated, and has proved very effective, *Morita et al C. parvum* oocysts exhibited high resistance to UV irradiation, requiring an extremely high dose of 230 mWs/cm² for a 2-log₁₀ reduction in excystation. However other studies (Clancy et al 2004) have shown a UV light dose as low as 10 mJ/cm² achieved 4-log. The efficacy of UVC irradiation will depend upon the water quality and the pre-treatment systems.



The best approach would be to combine secure AFM filtration and UVC irradiation. AFM will not exhibit transient channelling, and will provide a log 2.5 to log 3 reduction in oocysts without the use of coagulation or flocculation. When combined with catchment area management, AFM filtration provides a much more secure water supply than would be possible for sand filtration. Based on data provided by IFTS, AFM grade 0 is more than 100 times more effective than 16 x 30 grade sand at removing sub 4 micron particles.

AFM is a direct replacement for sand in any type of sand filter, upgrading existing water treatment systems to AFM is a simple retrofit. AFM will not only reduce the Risk to the network from Crypto and Giardia, the improved filtration reduces the chlorine oxidation demand by up to 50% and negates or reduces the need to use coagulation and flocculation.

References

Clancy et al, 2004 Susceptibility of Five Strains of *Cryptosporidium parvum* Oocysts to UV Light; Journal of the American Water Works Association March 2004 Volume / Number: 96, Number 3

Morita et al, Efficacy of UV Irradiation in Inactivating *Cryptosporidium parvum* Oocysts [Appl Environ Microbiol.](https://doi.org/10.1128/AEM.68.11.5387-5393.2002) 2002 Nov; 68(11): 5387–5393.doi: [10.1128/AEM.68.11.5387-5393.2002](https://doi.org/10.1128/AEM.68.11.5387-5393.2002)

L. Savioli; *Giardia* and *Cryptosporidium* join the 'Neglected Diseases Initiative'; Trends in Parasitology Volume 22, Issue 5, p203–208, May 2006