AFM® performance - Oil in Water removal

Many industrial processes produce oily water as a by-product and this needs to be cleaned before it can be either discharged or reused. Typically, sand or sand and anthracite is used as a filtration media but this quickly becomes coated with the oil which is not removed by backwashing. The oil in turn sticks to particles in the water, which quickly block the surface of the filter and render it non-functional.

An example of this is the cooling water for steel rolling mills where large quantities of water are circulated to cool the machinery. In addition to hard flakes of mill scale, this water picks up oil and grease used for lubrication as well as hydraulic oil from leaks and failures. The hot water is traditionally passed through sedimentation and filtration stages prior to cooling in a standard cooling tower. Whilst some oil will float to the surface during the sedimentation stage where it can be removed, much of it remains in emulsion as it enters the filter resulting in contamination as shown in the picture to the left, which leads to deterioration in performance and eventual failure.

Replacing the sand or sand/anthracite with AFM® can greatly alleviate this problem. The activated surface of AFM® prevents the oil and other contaminants sticking and allows 100% removal by backwashing with water.

A comparative trial of AFM® and new sand/anthracite was carried out at a steel mill over a four month period using the existing mill filters as a reference. The flowrate of the influent water in all the filters was quite high at $30m^3/m^2/h$; the media bed depth of the sand/anthracite was 2.1m whilst that of the AFM® was only 1.2 m comprising 200mm of AFM® grade 3 as a bottom layer and 1000mm grade 2 on top. Parameters monitored were efficiency of turbidity, suspended solids and oil removal, these were measured twice weekly.

As expected, the new sand/anthracite showed better performance than the existing filters although this deteriorated rapidly during the four month trial. The AFM® showed significantly superior performance to the other media throughout the trial in all of the measured parameters. If, for example, we look at the removal efficiency for suspended solids, viewed in terms of what remained in the water after filtration we see **AFM® performance was 60% better than the new sand/anthracite filter and 248% better than the existing sand/anthracite filters.**

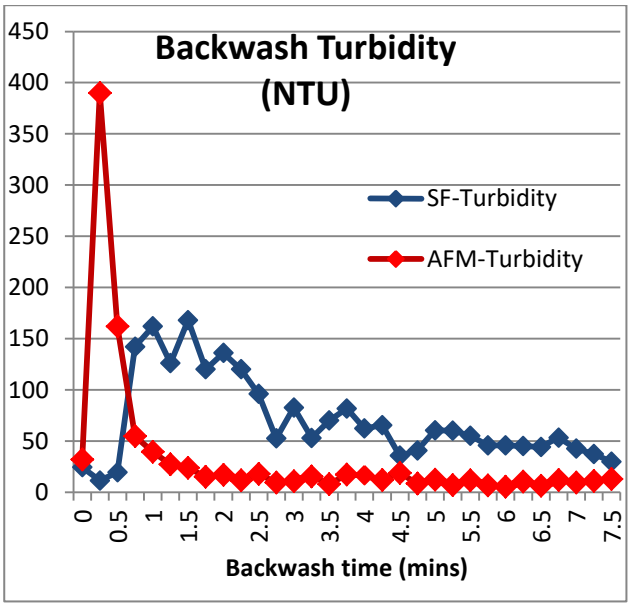
However and perhaps more importantly, the performance was much more predictable and stable with AFM®, which in practice relates to much more control of the process and better quality of cooling water in the rolling mill.

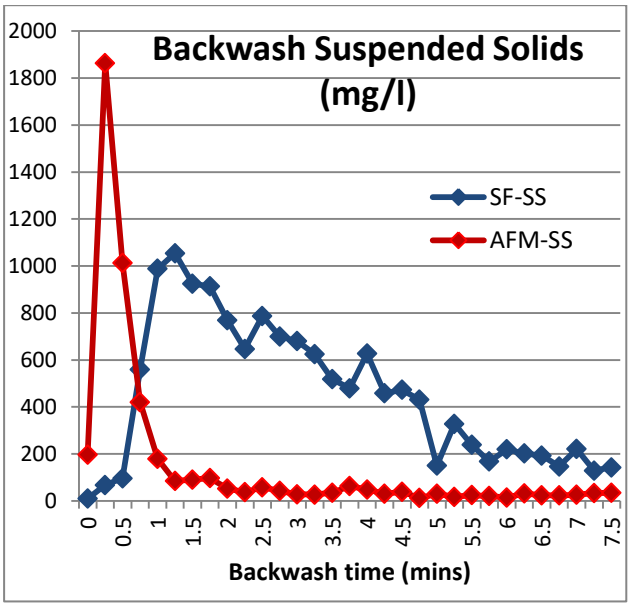
In spite of being measured only twice weekly, instances were observed in both the existing mill filters and the new sand/anthracite filter where the oil level in the product water was greater than in the influent water. This was attributed to the inevitable biofouling of the media and consequent channelling of the media bed allowing the oil that had built up to be spontaneously released. This phenomenon was never observed with AFM® which does not biofoul and therefore is not susceptible to channelling.

AFM® is superior in numerous ways to other filter media, but its backwashing performance is exemplary. This pays dividends in terms of longevity – AFM® will last the lifetime of the filter whereas other media need to be replaced after a period of operation. This superiority was observed during the trial by taking samples of the backwash water from both the AFM® and new sand/anthracite filters every 15 seconds and measuring turbidity and suspended solids. The results are shown graphically below.

Dryden Aqua Distribution AG
Industriering 68, 4227 Büsserach
Switzerland
Tel: +41 61 789 91 80

www.DrydenAqua.com





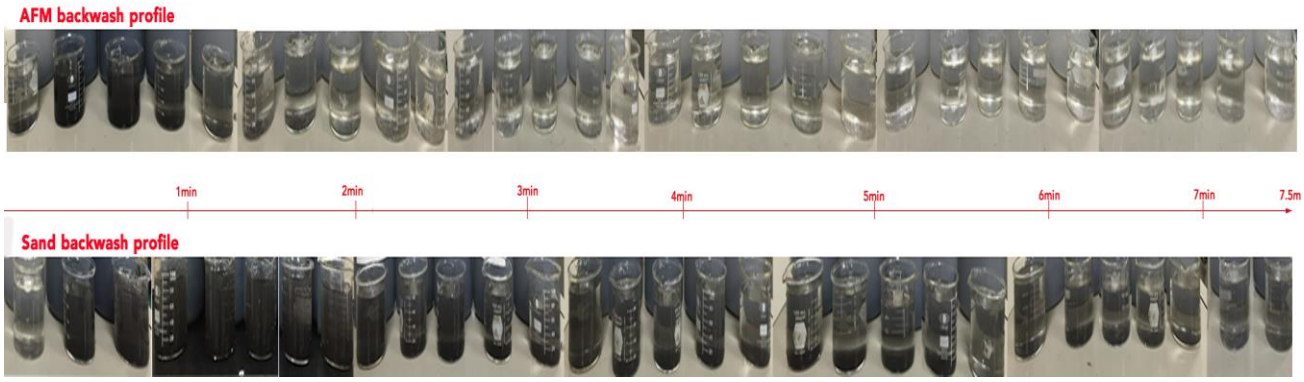
Backwash test –Turbidity

Backwash test – Suspended Solids

The AFM® plots (red) show a sharp spike as the contaminants are rapidly removed from the media by the shear forces generated by the backwash water over the electrostatic forces holding them in place. This diminishes rapidly as all the contaminants are removed and after approximately 2 minutes everything has been removed and there is no further improvement in the backwash water quality, i.e. it is now visibly clear.

The sand/anthracite (blue) on the other hand takes some time to start to remove the contaminants that are being held by the oil and biofilm on the surface of the media. The removal is erratic throughout and even after 7.5 minutes of backwashing, the quality of the water is worse than that of AFM® after just two minutes.

This is shown visually against time below.



The superior backwash performance of AFM® can lead to savings in water used as well as power used for pumping. These can be very significant!

Superior quality water used in the industrial process will lead to greater reliability, less maintenance and reduced downtime. Where, as in the above example a cooling tower is involved, AFM® filtration will reduce water treatment costs due to less chemicals being used and cleaner water in the sump, as well as increased heat transfer in the tower.

There will also be significantly less bacterial contamination and biofouling in the tower, as well as lower risk of the spread of legionnaire's disease.

Dryden Aqua Distribution AG
Industriering 68, 4227 Büsserach
Switzerland
Tel: +41 61 789 91 80

www.DrydenAqua.com