Algas Microfilters And Water Conservation

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There is a ever-growing need for mills to conserve water.How can this be done?

The Algas concept-a well-established design-can help to conserve water,and at the same time will save raw material where appropriate-provide more flexibility of operation,either on its own on in conjunction with existing water treatment plant-and in its comparatively new application can reduce discharge costs and enable mills to meet new legislation.

The application of the Algas Microfilter was originally to be installed close to the paper machine in order to recover fibre for re-use,with the clarified water replacing fresh water on wire showers and vacuum pump sealing,etc.

Its extension into other areas was helped with the development by the filter cloth manufacturer of improved and finer mesh material.This enabled the filter to be used, for example:-

- to treat incoming raw water in place of sand filters ;
- polishing the supernatent from savealls to enable the resulting filtrate to be safely used on wire shower applications-or provide a consistently good quality of water to meet newly-introduced discharge limits;
- more selective areas including cleaning water circulating through cooling towers to prevent build-up in both the towers themselves and heat exchangers.

Coupled with the-ever-increasing needs to conserve fresh water and to treat waste water more effectively, the Algas filter's application is now extended both to primary effluent treatment and to polishing the final clerified water from BOD treatment plants.

Already this latter application is being actively evaluated for use into other industrial areas,such as municipal sewage treatment.

Turning to the filter design itself,although being a drum filter it has distinct features incorporated in its design which enable it to be very flexible in operation and to overcome many of the problems associated with conventional drum filters,especially when handling difficult slurries.

The two main design features are the corrugated drum surface,which provides three times the filtration area compared to a flat surface drum,and an inside-out filtration principle,as opposed to the conventional outside-in method.

Fig.1 shows the general principle of operation.In the first stage of its filtering cycle and before a mat

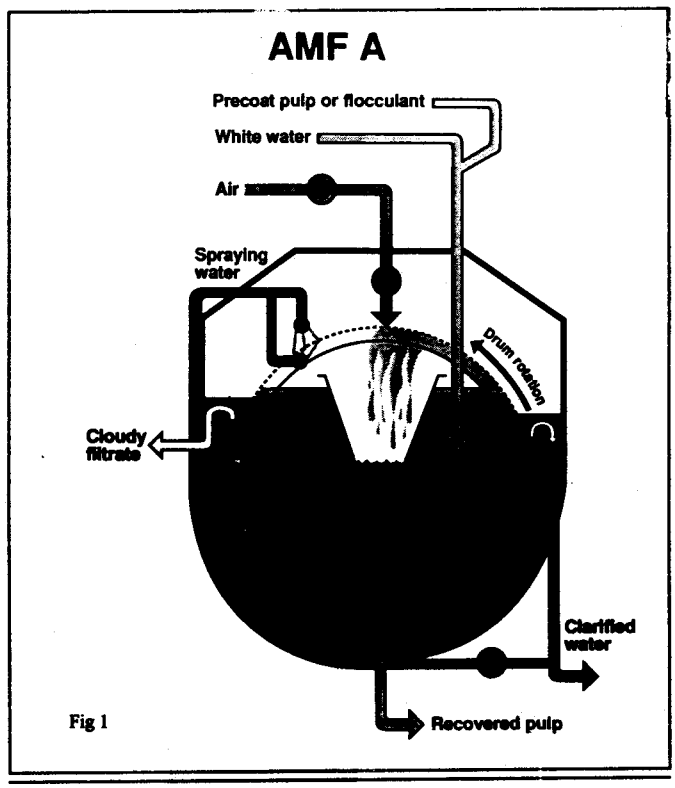

Fig 1

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is built up on the inside of the drum,a first pass cloudy filtrate can be removed if necessary

Once the mat is established,filtering is carried out through this,the clarified water overflowing accross a weir on the exit side of the drum.The retained mat is removed from the inside of the drum into a centrally-mounted solids collection trough,either by a water or air shower,or combination of both.

On the return cycle, the filter cloth is continuously cleaned by to fixed showers - on the inside and outside - before returning to its next filtering cycle.

It can be seen that the cleaning showers use the clarified water from the filter itself, and the filter cloth can range in size from 10 up to 400 micron, depending on the application.

The filtering process used can be said to be 'soft', as the only pressure defferential applied is the head beetween the inside and outside levels of the drum. As there is no applied vacuum to assist filtration, particles of suspended solid are not impacted into the mesh, and so are easily cleaned by the cleaning showers. Similarly, as the filtration principle is from the inside out, no roller or scraper is used, solids being removed by an air/water knock- off shower.This increases the working life of the filter cloth to between1-5 years,depending on the fitness of cloth and the application for which the filter is being used.

In order for the filter to be able to handle both variations in flow and suspended solids, the filters are very often supplied with automatic level and speed control. This adjusts the drum speed to concide with the level in the filter vat, which may change if either the flow or solids alter, affecting the hydraulic throughput of the unit-i.e.if the level in the vat increases, then the speed of the drum will increase correspondingly, or vice-versa. With automatic operation in place,the need for operator attention is negligible.

I mentioned earlier that the Algas filter concept was originally used for fibre recovery and clarified water re-use. However,its application has been extended to other water treatment areas, such as raw water instead of sand filters,etc-polishing the supernatent after flotation units-cleaning the water circulating through cooling towers, etc; but perhaps its biggest growth area is in its successful use for primary effluent treatment,either independently or in conjunction with existing primary treatment systems. The Algas concept provides advantages not only in space and installation time,but also to overcome common problems associated with traditional methods of efflunet treatment.

This can be best illustrated by an installation (Fig.2) of Algas filters in a UK paper mill, where increased production was gradually overloading an existing traditional effluent treatment plant; this situation was compounded by an NRA review which demanded a reduction in suspended solids of 50% of the previous level, and BOD by 80%.

Anticipating the new consents were going to be tougher, the mill had already planned larger surface aerators and some upgrading of oxygen injection into their BOD system, along with a secondary settlement tank and associated thickening equipment. However, they had still to give serious consideration to problems existing in the primary clarifier, which was suffering from floating sludge created by gas fermentation within the tank, producing a carryover of solids to the following BOD treatment plant.

The floating sludge was a problem in itself, as it formed a thick crust which was difficult and time-consuming to remove or disperse - and this very operation of course considerably affected the cleanliness of the water passing from the clarifier to the BOD treatment system. In any case, under normal operating conditions the floating sludge problem caused a carryover of solids to the BOD plant and on to the secondary clarifier, which in turn suffered from the same floating sludge problem-albeit to a lesser degree than in the primary-adversely affecting the total suspended solids in the final effluent discharge to river.

In order to try to overcome the problem,various solutions were tried, mainly by using chemicals, but this did not prove successful and there did not seem to be an easy solution.Therefore the installation of a duplicate primary clarifier was discounted,as it was considered the same problem would occur.

The mill also wanted to try to use more recovered fibre from the effluent system into their

board- making machines; and although some fibre was being recovered, the opportunity could not be fully utilised because of the deterioration it suffered as a result of the time spent at the bottom of the clarifier which caused prodution problems in the manufacturing process.

Similarly, the mill were anxious to re-use the maximum amount of clarified water recovered from effluent, in order to reduce abstraction rates; but this was difficult, as the quality of recovered water from the primary clarifier was unreliable.

As an alternative to sedimentation for primary treatment, the mill turned to a comparatively new concept for primary treatment-Algas microfilters. After on- site test filters trials, two 70 m^2 filters, fitted with 120 micron screens, were installed ahead of the existing primary clarifier.

From start-up,the effect of the Algas filter installation was immediate and dramatic.

With the total effluent flow now being treated by the filters, the effluent was separated into:

- usable fibre, which was returned to the mill;
- clarified water of a sufficient and continuous quality to be re-used in place of fresh water on the paper machines;
- unwanted fine non-fibrous solids,such as chalk and clay, mainly from their coating machine,the presence of which had previously also presented a problem when trying to reuse solids from the clerifier.

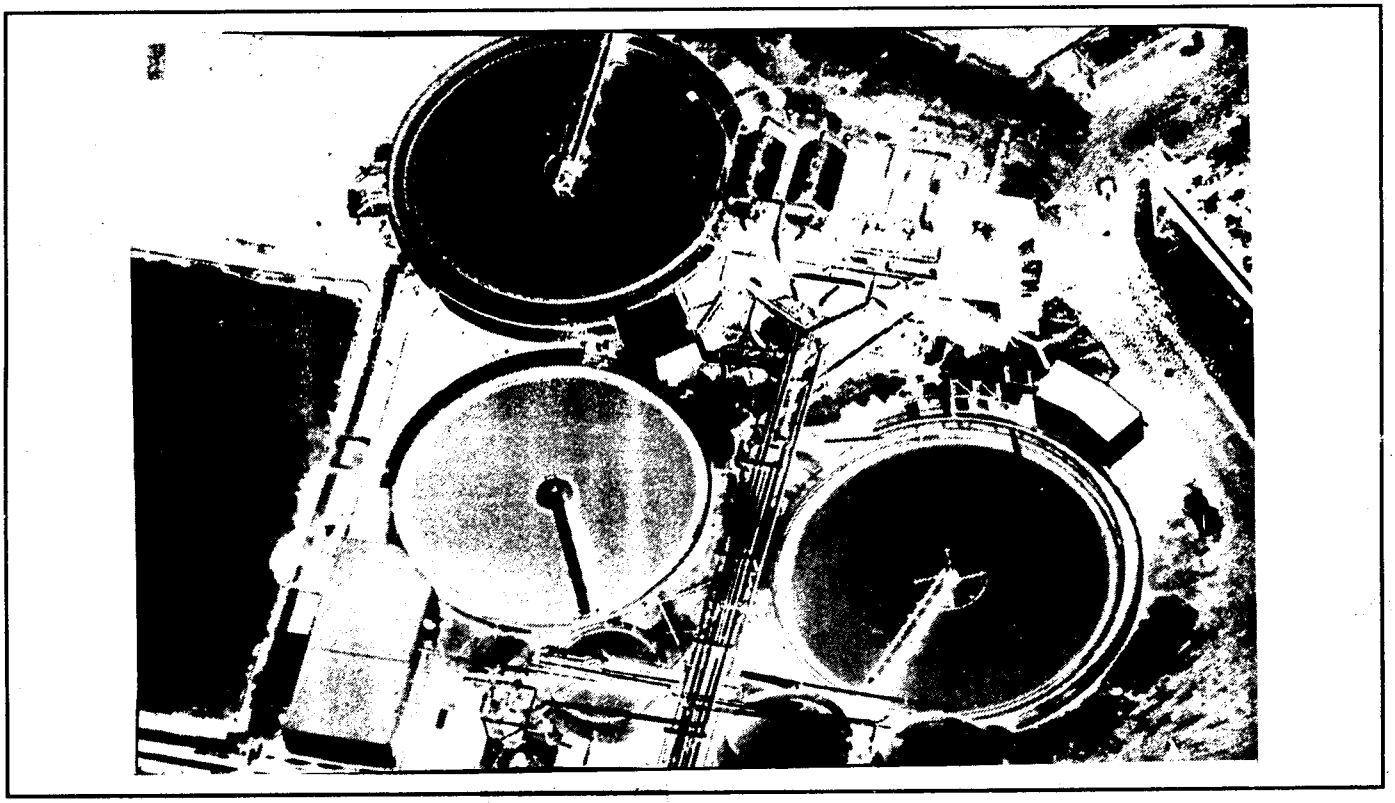
These separated fines and fillers were passed forward to the existing primary clarifier, where they settled out.

This separation, although desirable, was not possible using sedimentation.

Although there was still some slight gasification in the primary clarifier, no floating sludge problems occurred, as all fibre had been removed by the filters.

No chemicals were used in the filtering process,as the Algas design enabled the mill to use them in a "fractionation"operation,removing from the usable fibre the unwanted fine particle element.

Because of their extremely compact design the filters have a holding capacity of less then 5% of the existing primary clarifier (see Fig.2). Also, the



"process time"in the filters is a matter of minutes compared to hours in the clerifier, there was no material deterioration, thus enabling all the recovered fibre to be successfully re-used on the board machines-without operating problems-thereby providing a considerable cost saving.

Installation was extremely simple; the filters-being fabricated as a completely independent unit-were quickly and easily lifted on to prepared foundations with no disruption to the running of the existing plant before the final hook-up was made.

After commissioning in December 1991, it could quickly be seen that not only was there a considerable improvement in both the quality of recovered fibre and clerified water being returned to the mill, but the floating sludge problem had been completely eliminated, both in the primary and secondary clarifiers; and afte comissioning the remainder of the newly-installed plant, the mill was quickly able to achieve full compliance with the stringent new British National River Authority consent conditions.

This installation won the mill the ENVIRONMENTAL SOLUTIONS AWARD FOR INDUSTRY 1992- Manufacturing Industry sector.

The experience gained from this and other primary treatment applications has enabled Algas to extend the application of its filters further into effluent treatment, such as the final polishing of supernatent from biological treatment plants.

This application is showing considerable advantages in removing from the final discharge flow from a BOD treatment plant any filamentous growth ("bulking") which may occur from time to time and which is a condition often difficult to counteract quickly.

In this polishing application the filter concept was not originally intended to be part of the biological treatment plant. However, because of the living nature of this part of the process and sometimes the difficulties in its control, mills are releasing the benefits of a final physical barrier to take out variations in solids in the final discharge - especially in the light of more stringent legislation.

Algas (in close co-operation with industrial parterns, research institutions and pollution control authorities) are now taking the area of biological application a stage further,and are working to develop a microfilter system which will work in conjunction with aerobic treatment plant instead of using conventional sedimentation basins

Results have so far indicated that the efficiency of the biological system has been improved by the filter increasing the concentration and improving the control of the return sludge. Furthermore, the clarity of the filtrate can be better controlled, eliminating any danger of "bulking".

I hope that in this presentation I have given at least some initial information and evidence as to how the Algas filter concept-either independently or installed and in conjunction with existing and more traditional methods of water treatment plant-can provide:

- a compact and easy to install "package"
- a flexible and efficient means of handling variations in flow and solids,whilst still maintaining an acceptable clearity of filterate;
- a reduction in operation attention,maintenance costs and energy requirements;
- low chemical addition-if necessary at all.

The Algas filter concept is not the panacea to all water treatment problems: but I genuinely believe it is worth serious consideration, either to help in overcoming existing problems or installed in new plant as an alternative to conventional systems.