DELIVERING EFFECTIVE SEWAGE TREATMENT FOR FIFO SITES

AEROFLOAT'S STAFF HAVE BEEN PROVIDING WASTEWATER TREATMENT SOLUTIONS FOR OVER FIFTY YEARS. MANAGING DIRECTOR RAY ANDERSON TALKS TO ***AUSTRALIAN MINING*** ABOUT HOW IT DELIVERS EFFECTIVE SEWAGE TREATMENT TO FIFO CAMPS ACROSS THE COUNTRY.

Fly in, fly out (FIFO) accommodation for workers at remote sites can greatly range in size. From smaller, cabin-style dongas to larger camps with facilities to rival quality hotels, FIFO accommodation shares one thing in common that is sometimes overlooked: they all need safe and efficient sewage treatment and disposal systems.

In modern FIFO setups, each unit will usually have its own toilet and shower, with communal setups reserved for kitchens and laundries. The domestic sewage generated at FIFO camps by all staff, which can run into the thousands at the largest operations, has to be safely collected, treated and disposed of in an environmentally acceptable manner.

New South Wales-based wastewater treatment company Aerofloat specialises in this service for FIFO camps and similar sites and has patented solutions over time that have been developed over several decades to improve the efficiency of this process.

There are several challenges to deal with when providing sewage treatment plants (STPs) to mine sites according to Ray Anderson, managing director of Aerofloat, who possesses over 50 years of experience in the wastewater treatment industry.

"One of the challenges with mine sites relates to the fact that the habits of the individuals are very similar," he explains.

"Most people are getting up at the same time in the morning — say 5am or so for a day shift operation — so you'll get maybe 30–40 per cent of the flow coming out in a tight period of one hour in the morning, and a similar amount during a one-hour period in the afternoon or early evening.

"These peak flows are quite excessive and that has a significant impact on how you design these systems.

"It's a necessity for those of us who design sewage plants to have an understanding that you can't just go and put in a normal sewage plant designed for typical average and peak flows."

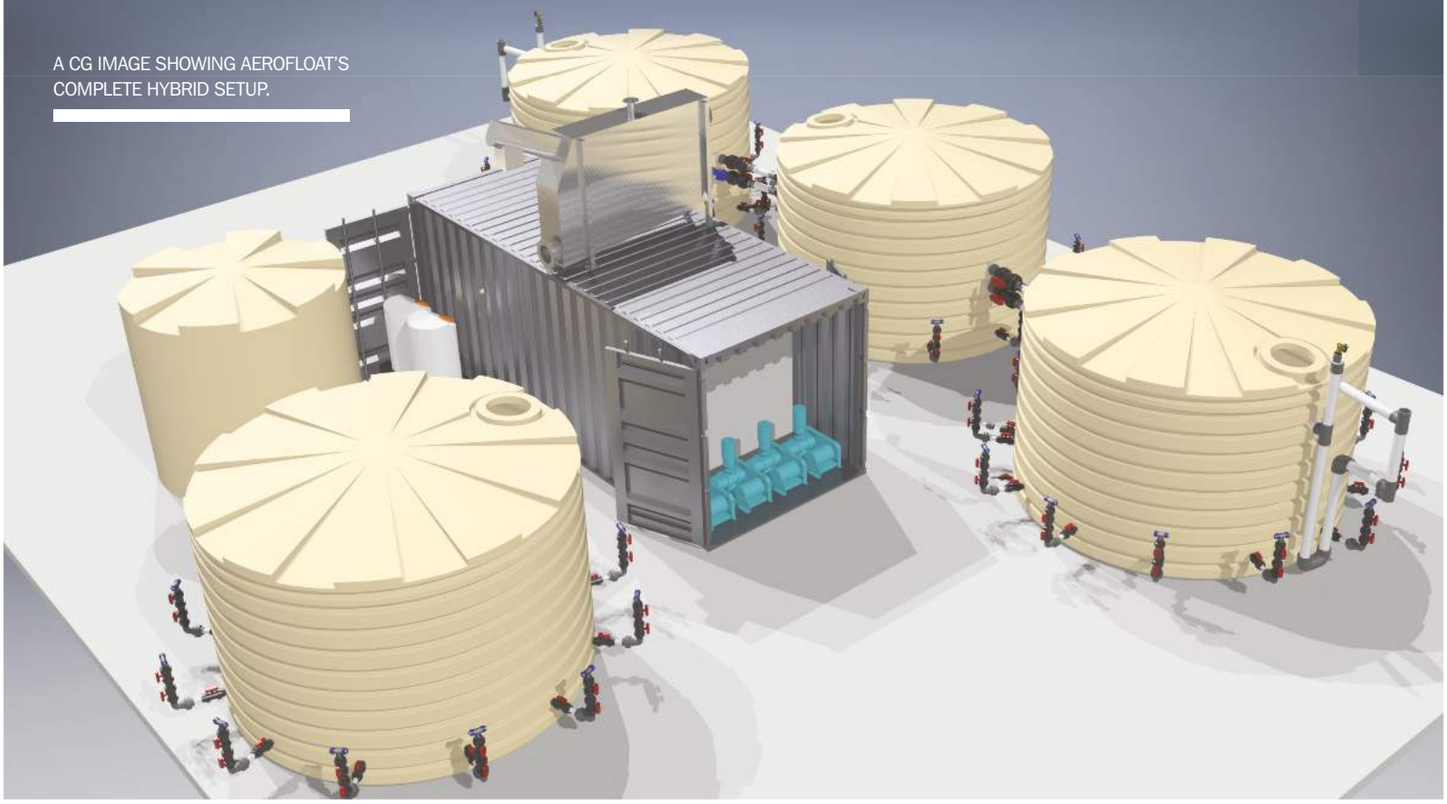
In response to these challenges, Aerofloat has developed a system to meet the challenges of mine site sewage treatment that emphasises the screening process.

The traditional solution is to use a large hydraulic balance tank to mix and transfer sewage into a treatment plant. However, these tanks can be large and problematic if not carefully aerated or mixed as they can accumulate solids that can lead to problems down the line.

Aerofloat's method implements several tanks in the process. Raw sewage is pumped to a specially designed screen fitted with a self-cleaning auger prior to a balance tank. The balance tank is intermittently aerated to keep the tank mix odour free.

After this, the screened sewage flows into another tank of Aerofloat's design called a Moving Bed Biofilm Reactor (MBBR). The MBBR is aerated with multiple blowers and Aerofloat's unique patented lance aeration system, which provides improved and optimal aeration and mixing.

From the MBBR, the semi-treated sewage, in conjunction



A CG IMAGE SHOWING AEROFLOAT'S COMPLETE HYBRID SETUP.

with excess biomass, flows to one or more tanks called Sequence Batch Reactors (SBRs), which again use multiple blowers and Aerofloat's lances to provide optimal and intermittent aeration and mixing.

Periodically, biosolids are returned from the SBRs to the MBBR tank to balance the excess solids between the tanks.

After a period of time the aerators in the SBRs turn off and the micro-organisms in the SBR are allowed to settle, typically for one hour. Then,the clean, treated water on the surface is decanted off the top of the tank using Aerofloat's unique Air Locked Syphon (ALS) decanting system.

"The treated effluent leaves the SBR as clean water but it still has many microscopic organisms in there that can potentially have detrimental health effects if you don't do something about it," explains Anderson.

"So, what we do is treat it with chlorine by injecting it into the water as it's flowing out during the decant time. That provides the mechanism for killing all these millions of little microorganisms that can't be seen by the human eye."

The treated and disinfected water is then transferred to a holding tank, to be used by the client for site irrigation and beautification.

Periodically, a waste-activated sludge pump is also used to dispose of excess biosolids from the MBBR to an adjacent tank. These biosolids are further thickened in this tank and can then be disposed of by tankers for dewatering or other purposes, such as soil conditioning.

While MBBR and SBR systems are not unique to Aerofloat, they are generally used in isolation; Aerofloat uses both as part of a hybrid technology that provides the advantages of both in a single process.

Aerofloat's multiple lance system is also a significant addition not just for the improved aeration and mixing it provides during effluent breakdown, but because they are easy to remove and clean compared to traditional aeration tank pipes and diffusers which are normally bolted on the floor of the tank. The consequence of this is that Aerofloat's system is also easier to repair, leading to less downtime and improved efficiency.

"When the diffusers block or rupture on a typical tank, you've actually got to drain it, remove all the bio-media, get into the tank and repair it," Anderson explains.

"We don't have that. We can just repair it by removing the lance from outside the tank without draining it because we have a specially patented, double sealed arrangement that enables us to do that.

"We have pipework connected from the blowers to those lances but the lances are designed so you can take them out and clean them without shutting down the plant."

This combination of factors provides additional robustness to the system so that it won't break down even under heavy loads.

The mechanical components (blowers, pumps, electrical controls etc.) in Aerofloat's plant are fitted into a container and tested at its factory facility in New South Wales.

One of the features of Aerofloat's hybrid design is that all of the tanks are manufactured from standard off-the-shelf polyethylene tanks and these tanks have modifications made to them prior to sending to the FIFO site.

Since the tanks are made out of plastic and its pipes can be fitted and removed without complex tools, the complete system can be relocated in this way with relative ease.

AEROFLOAT'S MBBR TANKS ARE MADE FROM POLYETHYLENE, MAKING TRANSPORTATION EASIER.

"It's a relatively simple site installation requirement," says Anderson.

"The container can be lifted and put on the back of the truck for relocation once you take the mechanical equipment off the top. So that's another feature — the portability between different mine sites."

The system is also compliant with Australian regulations, particularly tight rules around the removal and disposal of nitrogen and phosphorous.

Between aeration and non-aeration periods, the MBBR uses an optimised nitrification process that converts ammonia into nitrate during aerobic conditions (i.e. conditions where dissolved oxygen is present).

The converse of this is denitrification, which is used in conditions with no dissolved oxygen (anoxic conditions) and this reduces the nitrate into nitrogen gas.

These processes reduce nitrogen into nitrogen gas to be removed. Both of these are important to reduce overall nitrogen concentration in the sewage. Typically, this leads to nitrogen levels of less than 15mg per litre.

Aerofloat takes pride in the design of its hybrid system, particularly in its versatility, portability, simplicity of maintenance and overall. AM