

Innovative solution for sewage treatment heralds a sustainable future for mining camps.



Aerofloat's innovative AeroMBBR technology

The National Resources Review talked to Ray Anderson of Australian wastewater treatment company, Aerofloat, about the environmental and financial implications of adaptable sewage and wastewater treatment plant designs in mining camps. Anderson, known for his work in developing and installing over 500 sewage treatment plants around Australia, sees the industry on the cusp of change.

Anderson highlights the opportunities that innovative wastewater treatment designs can offer the industry, advice that is more important than ever as the industry is scrutinised for more sustainable practices. He also emphasises the need for treatment designs that can be transportable, are reusable, and most importantly, can adapt to the huge fluctuations in mining camp populations.

Aerofloat, the brainchild of Anderson, and his fellow founders, Michael Anderson and Katie Moor, offers adaptable, scalable and ultimately cost-effective sewage and wastewater treatment for mining camps. The company is fast becoming a key driver in the industry having recently won a Consensus GreenTech award for innovation. Consensus Group's GreenTech Award Judging Panel said Aerofloat's innovative designs herald its continued success in the wastewater treatment industry.

"Aerofloat sets new industry benchmarks, providing exceptional customer and product support that adhere to standard codes and compliance," said the Consensus Group's representative.

Aerofloat's technology and patented solutions have been developed over many decades. The company has applied its innovative approach to wastewater and sewage treatment solutions to the unique challenges facing the mining industry. Anderson says that the remote fly in, fly out (FIFO) accommodation requirements for mining camp workers must be able to withstand significant fluctuations in sewage flow rates and population sizes.



Mining camp populations require adaptable sewage treatment solutions

Adaptable sewage and wastewater treatment is vital to a healthy mining population.

"The need for safe, reliable sewage systems that can adapt to huge flow fluctuations and very high peak loads is often under-estimated in the planning stages of mining camps. In

modern FIFO accommodation, units come with individual toilet and showering facilities. Communal areas like the main site office, kitchens and laundries also need adequate sewage and wastewater treatment systems.”

Peak flow rates in mining camps are significantly different to other domestic camps, as the population tends to follow similar day patterns.

“People are waking and showering, using facilities at the same time each morning in order to start the first shift of the day. This means that 30-40 percent of the flow occurs during a one-hour period in the day, and again in the evening when that population returns,” said Anderson.

“Normal domestic sewage and wastewater treatment plants are simply not up to the job,” commented Anderson. “Mining camps require systems that are specific to the intense fluctuations in peak flows, further impacted by fast population increases.”

“Mining camp populations can number in the thousands and the potential threat this poses on the environment must be effectively managed. A sewage treatment plant design needs to keep up with these changes in population to ensure both the environment and human health are not negatively impacted,” said Anderson.

Mining camp sewage and wastewater can include bacterial diseases such as diarrhoea, shigellosis and salmonellosis, as well as viral diseases like gastroenteritis and Hepatitis A, and parasites. Poor treatment of the sewage or wastewater can lead to infection of the mining camp population.

Aerofloat’s solutions offer more sustainable operations – creating opportunities for water reuse and recycling.

“The mining industry must look to sustainable practices in water use. Wastewater reuse and recycling is key to this,” said Anderson.

“With the intensive water-use requirements in mining, creating opportunities for water reuse means significantly less impact on the environment and a much healthier bottom line. Reducing the amount of sludge produced also means less dollars being literally trucked away.”

The water from Aerofloat's sewage and wastewater systems can be transferred to a holding tank for use in site irrigation and beautification, along with other uses.

"The proposed use for the water will impact what level of effluent compliancy is required, so we ensure that level is met. Potential uses of the recycled water include irrigation, dual reticulation such as toilet flushing or washing machine water, and process water," said Anderson.

Aerofloat's sewage treatment design for the mining industry is simple, cost-effective, durable and easy to transport.

"The mining industry must ensure it uses adaptable technology that offers a repeat solution. Mining sites move on once resources are depleted – the vehicles, drills and major building structures have been developed for repeat use at a new site – it's now a given expectation. Sewage and wastewater treatment technology should be the same," said Anderson.

Aerofloat's modular, flexible design can treat sewage for populations that fluctuate from 100 to 3000 individuals. The design modules are easily installed or removed as required, minimising initial financial outlay and simplifying installation

"One of the big differentiators with Aerofloat is that we manufacture our systems locally. This means no delays due to overseas imports, and our team can create a system specific to each client's needs."

The mechanical components such as blowers, pumps and electrical controls are tested at Aerofloat's factory facility in New South Wales and fitted into a container for transport.

Light-weight polyethylene (PE) tank designs mean economic transportation. The tanks are also very durable – able to withstand the harsh Australian sun – and are a low-cost alternative to stainless steel or painted carbon steel tanks.

For remote locations, most of the mechanical components arrive in a container fully assembled, pre-wired and ready to go. The lightweight PE tanks are delivered to site – installation simply requires connecting the pipework. Given the tanks are made of plastic, the pipes can be fitted and removed without complex tools. Aerofloat's design also allows for easy relocation to alternative sites if the development has a short life expectancy.

On site, Aerofloat's wastewater designs with unique aeration lances and decanting mechanism can be easily fitted to the tanks. The sewage treatment plant blowers, control panel and other mechanical components fit into a shipping container.

"It's important to keep installation a quick and simple process at mining sites. Ensuring that most of the parts are assembled and pre-wired is essential. The parts also need to be easily disassembled when that site is no longer in use," said Anderson.

The parts can be easily placed on the back of a truck for relocation once the mechanics are removed from within the tanks.

Aerofloat's sewage treatment plant design applies its patented Aerofloat aeration system to create a simple and effective solution.

Aerofloat offers a range of technologies to account for variations in location and local discharge standards.

Upfront, aerated balance tanks are often used in mining camps due to usually high peak flows experienced in these camps. In addition to the economical and transporting benefits of the lightweight design, Aerofloat also offers a unique, patented lance aeration system and an air locked syphon (AeroALS) decanter in its sequence batch reactor (AeroSBR) process. Both these key components are readily fitted and easy to remove from the tanks. There is also no regular cleaning or membrane replacement required with the AeroSBR. Single tank designs are suitable for smaller populations, multiple AeroSBR tanks are used for larger populations.

In some applications hybrid moving bed biofilm reactor (AeroMBBR) and AeroSBR technology can be used, which is a series process with the AeroMBBR reactor proceeding the AeroSBR reactor.

Aerofloat steers away from more traditional solutions such as large hydraulic balance tanks, which can often be problematic. When hydraulic balance tanks are not properly aerated and mixed, solids can accumulate and cause issues further down the line.

Aerofloat's alternative is to use several tanks in the process.

Raw sewage is pumped to a specially designed automatic screen and then flows to a balance tank. The balance tank is intermittently aerated to keep the tank well mixed and odour free.

Following this initial process, screened sewage flows into Aerofloat's specifically designed AeroMBBR. The AeroMBBR is aerated with multiple blowers and coupled with Aerofloat's unique patented lance aeration system, which provides optimal aeration and mixing.

The semi-treated sewage, in conjunction with excess biomass, flows from the AeroMBBR to one or more AeroSBRs, which again use multiple blowers and Aerofloat's lances to provide aeration and mixing.

The treated and clean water on the surface of the AeroSBR is decanted off the top of the tank using Aerofloat's unique AeroALS decanting system once the aerators have been turned off and the micro-organisms in the AeroSBR have settled.

"By this stage, the water in the AeroSBR is considered clean, however given the risk of microscopic organisms still present in the effluent, we further treat with chemicals. Chlorine is injected to disinfect the effluent as it flows from the AeroSBR," said Anderson.

"This water, now treated and disinfected, can be transferred to a holding tank, to be used by the client for other uses, such as site irrigation and beautification."

The sludge produced in the process is highly stabilised. The waste-activated sludge pump periodically disposes excess biosolids from the AeroSBR to an adjacent tank, where it is further thickened prior to disposal.

Aerofloat's innovative use of the AeroMBBR and AeroSBR systems as part of a hybrid technology, sets it apart from other wastewater treatment providers in the industry. The company's patented technology means a far more effective effluent treatment process.

The process also offers financial benefits as it requires less maintenance and operator-time.

The unique lances in the system can be easily removed and cleaned; in other systems the tank pipes and diffusers are bolted to the tank floor, meaning when there is any blockage or rupture within the tank, it must be completely drained and pulled apart for repair.

"Aerofloat's systems are different. They can be easily repaired by simply removing the lance from outside the tank without draining it because we have a specially patented, double sealed design," said Anderson.

“The pipework is connected from the blowers to the lances, but our design means you can remove the lances and clean them without shutting down the plant.”

As a result, the Aerofloat system is a robust, maintenance-friendly and environmentally sound option for the industry.

Aerofloat also offers remote monitoring support – essential in remote mining camps.

“Identifying any issues or potential problems in isolated mining camp sites is vital to success,” says Anderson.

Aerofloat’s simple program logic controllers (PLC) and human machine interfaces (HMI) with optional remote monitoring capability allow Aerofloat engineers to assist local operators with the plant operation in real time, regardless of their location.

“Remote monitoring by our engineers means that mining camp staff have access to Aerofloat’s expertise in real-time, helping to get the system back on track with minimal delay. However, our clients predominately use the system just to check-in that it is operating at optimal level.”

Aerofloat’s reusable and recyclable sewage and wastewater treatment systems come at a critical time for the industry as it strives to be more sustainable.

Adaptable systems that can be scaled up or down to meet population demands, and transported and installed economically, have significant financial and environmental implications for the industry. Aerofloat’s modular-use designs offer opportunities to reuse wastewater within mining sites. Cost-effective and sustainable wastewater treatment is now a must-have for the industry.

Find out more about Aerofloat’s solutions for the industry at aerofloat.com.au