

Guarding our water

Wasabi Energy's Aqua Guardian Group has completed the first mine installation of its AquaArmour technology at the Tropicana gold project in Western Australia. Carly Lovejoy spoke with Diane Bettess, Wasabi's chief operating officer, to find out more

An AquaArmour deployment at Booleroo in South Australia

Water is an essential element in the mining process. From abstraction through to treatment and discharge, the management of water in a mine setting is fraught with challenges and regulation. Add into the mix geographical and climatic issues, plus the remote locations in which many mines are now being established, and the process becomes even more complex.

Wasabi Energy, an emerging Australian power producer, also invests in sustainable solutions, and has attempted to address some of the critical issues associated with the storage of water at mine sites with its AquaArmour technology. The system was first launched in November 2010 by the Aqua Guardian Group, a company that is 79.2% owned by Wasabi, and was originally designed for water preservation at municipal water storage facilities, such as large open dams.

HOW DOES IT WORK?

The concept is relatively simple but has proven to be very effective, the company says. It is a modular cover that consists of a series of hollow hexagonal modules each about the size of a pallet (1.2m wide, 41cm deep) made from high-density polyethylene (HDPE).

Each module is coloured white to reflect light and contains six flotation balls. Small holes in the centre of the module on both the top and bottom mean that when the module is floated on a pond or dam, water can partially fill it to act as ballast; the modules weigh about 4kg when empty and 80kg when filled with water, which allows them to withstand winds of up to 200km/h.

The modules are floated on the water storage facility and are corralled using booms, which Aqua Guardian also provides to prevent them from riding up on the banks during high winds. The hexagonal shape allows the modules to tessellate when deployed en masse to form a blanket on top of the water. Ms Bettess explains: "We recommend that customers using AquaArmour cover about 85% of their water storage facility. This provides optimal protection against evaporation and algal growth while allowing some tessellation to provide intermittent sunlight penetration to preserve the quality of the water."



As the modules float around in their corral, they help to oxygenate the water, preventing it from becoming stagnant. The water can move freely in and out of the modules, which helps to keep them clean, and Aqua Guardian recommends that the modules are cleaned and turned over every five years or so to maximise their lifespan; each module has a life of approximately 20 years.

Because the modules are manufactured from food-grade virgin polymer HDPE plastic, they do not react with chemicals such as caustic soda, cyanide or highly acidic waters, and as they do not leach any contaminants they can even be used on potable water storage facilities.

To minimise transport costs, the modules are supplied in two halves and assembled on site. "To deploy AquaArmour, we offer a mobile deployment unit in a container," explains Ms Bettess. "This can be taken onto site and opened. Inside there is a machine that assembles the modules. It places the flotation balls inside and seals each unit around the circumference.

"One machine can produce two modules at a time. The cycle time is about one minute; for larger deployments multiple machines can be used. The minute you start putting the modules onto the pond, they start working. Some companies use a little slide to deploy them onto the water storage – within about a few minutes they fill with water and then they float off."

AquaArmour has been independently tested and has been proven to save a minimum of 88% of water that would otherwise be lost to evaporation (up to 94% has been seen by some clients). It also inhibits algal growth by lowering the water temperature and minimises ultraviolet and visible light penetration by 95%.

Because it is modular, the system is also scalable; projects have been as small as 950m² or as large as 23,000m², while early-stage discussions have progressed for a 150ha deployment.

AQUAARMOUR IN MINING

Having had significant success in the municipal market with AquaArmour, Aqua Guardian began looking to other water-intensive industries for potential new markets. The mining market was an obvious choice; in areas such as the Atacama Desert in Chile, 66% of the water used can be attributed to the mining industry. Due to the high level of demand, water rights sell for US\$2,500 to US\$3,800 per megalitre (ML). In addition, much of the water used at the mines is desalinated, which is estimated to cost an extra US\$3,000 to US\$4,000 per ML.

"Water is an extremely valuable resource in mining," comments Ms Bettess. "It is counterproductive to spend vast amounts of money desalinating water or trucking it to a site, to then put it into an open dam and have half of it evaporate. You will end up processing twice the amount of water needed and doubling your costs."

There are a number of different technologies available for dam water preservation and when Aqua Guardian began assessing the mining market, several operations were trialling solutions.

"There was a case in Australia where a company put plastic balls on the water to prevent evaporation, but what actually happened was that the balls rotated and increased the rate," explains Ms Bettess.

"The balls also flew off in high winds. There are solutions that use a chemical film to minimise evaporation, but most are biodegradable, so if it rains the chemical has to be reapplied. There are also others that are similar to ours but are much smaller, like a hard disc.

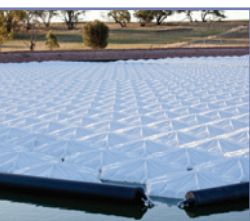
"Our solution was originally designed to reduce evaporation but has the added benefit of controlling algal growth too. It also keeps the water temperature and quality at a more constant grade, and minimises wave action on large bodies of water, which helps to prevent bank erosion and suspended sedimentation."

Ms Bettess continues: "For mining companies that are going to build a water storage area, say a tailings dam, if you know that you're not going to lose much water to evaporation, you can build a smaller dam – you won't need such a high-capacity facility. So there are construction and remediation benefits too."

AquaArmour has also attracted interest ►

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The modules are corralled using booms to prevent them from riding up onto the banks



Each module has a life span of approximately 20 years. Their hexagonal shape allows them to tessellate and form a cover on the water

for other applications in mining. Ms Bettess explains: "Last year we were approached by a mining operation in Utah (US) that uses heap leaching. They experience quite low temperatures during the winter months and asked if we could produce Aqua Armour in a dark colour. They could then use it as a thermal blanket to keep the leach liquor at a constant temperature; that was something we hadn't thought about previously. It's great that as people use Aqua Armour they come up with all these new ideas for applications."

"Another group recently bought some for weed control; they had weeds growing on the bottom of their reservoir that caused problems with their pumps. Aqua Armour could also be used to act as a cover for process water if you don't want bird life to land on it."

MARKET POTENTIAL

In 2011, over US\$8 billion was spent by the mining industry on water, with the Australian mining industry incurring a total water expenditure of US\$1.5 billion; more than any other country and almost double the next biggest spenders worldwide, which were Chile and China.

In November 2010, the Australian Bureau of Statistics reported that the amount of water consumed by the mining industry across Australia in 2008–9 was 508 gigalitres (GL). With the mining sector's growth, especially in iron ore, the Pilbara Regional Water Plan, 2010–30, predicted that mining water usage there would increase from approximately 75GL/y in 2006 to over 230GL/y by the end of 2012.

With these figures in mind, it made sense that Aqua Guardian's first target for mining sales was its home market of Australia. North and South America, particularly Chile, Spain and Africa are also flagged as potential future markets, along with China.

Ms Bettess says: "In the mining industry there is such a high level of risk assessment needed before a new technology can be adopted: we've gone through a period of nearly 12 months' testing with one company."

"Everyone's eager to be first to be second, so now we've had that first sale with AngloGold Ashanti, we believe that more will follow. Product awareness can be a huge barrier, but once people see a technology in action and see the results that a company is achieving, they become much more comfortable with the idea."

AngloGold Ashanti is the third largest gold producer in the world. It has 20 sites in operation across 10 countries with a focus on four operational regions, all of which display semi-arid to arid, water-



stressed zones, namely: South Africa, continental Africa, Australia and the Americas.

The Tropicana mine is 70% owned and managed by AngloGold Ashanti with Independence Group holding the balance. It is located 330km northeast of Kalgoorlie Boulder on the western edge of the Great Victoria Desert in Australia. The mine site covers 13,000km² of very remote terrain. The climate is arid, with temperatures of up to 45°C and the area receives 150-250mm of rainfall per year. The mine is currently under construction and is scheduled to pour first gold in the December 2013 quarter.

Aqua Guardian has now completed the deployment of Aqua Armour on a water storage facility that feeds Tropicana's reverse-osmosis water plant. This is the main supply of water to the site.

At the time of the sale, Tropicana's business improvement co-ordinator, Ian Winn, commented: "The product is portable, very flexible, easily scalable, requires minimal maintenance and has a 20-year life. The transferability of the product was also an important factor for us, as we are able to move it to a different pond or even change the shape of the pond, and we don't need a large amount of labour to move it."

"The other point is that water does not collect on the surface so we don't need to pump it out, and if one unit does get damaged, it is easy to replace."

And what does the client think of the system now it's up and running? "They're ecstatic," says Ms Bettess. "They're already seeing results and are very happy with how it is performing."

While Tropicana represents Aqua Armour's first mining application, seven installations have already been undertaken in other industries in Australia with further deployments expected in the coming months. Installations to date include Victoria Water Board affiliates Grampians, Wimmera Mallee (GWM) Water, Gippsland Water and South Gippsland Water. In South Australia, clients include the District Councils of Mt Remarkable and Boolaroo.

"It's had quite a few accolades in Australia," comments Ms Bettess. "We now have two deployments in Western

Australia. Not everyone's going to visit Tropicana because it's pretty remote, but we also have a site at a town called Merredin about two hours from Perth on the way to Kalgoorlie. We have been organising open days so that potential clients can come and see Aqua Armour in action; it gives it a whole different dimension when you see it in operation."

WHAT NEXT?

In Australia there are 364 operating mines. Approximately half of these are located in Western Australia, South Australia or the Northern Territory. The majority use open water storage facilities, and are located in arid areas where water availability is relatively low and access to water is expensive, so there is plenty of room for Aqua Armour sales growth.

"We have received interest from a wide range of potential customers in both the mining sector and water authorities," comments Ms Bettess. "We've just exhibited at two big water conferences in the US, and have already received an expression of interest from a large mining operator in South Africa."

"We've got a number of other mining orders in the pipeline. We have one very large operation in South America that is interested. They have over 100ha of potential water storage areas that they are looking to cover."

As in-situ performance data becomes available, Aqua Guardian expects to see an increase in secondary sales to existing clients and those considering initial smaller deployments before committing to multiple sites.

Ms Bettess adds: "It doesn't cost much to deploy these systems, but the benefit is huge. Many companies with high water costs can see a return on investment within a month or two. Trucking water into a mine is very expensive, as is treating and disposing of polluted water. Why not cover and preserve the water once you've got it to the site, or while you look at how best to treat and dispose of it?"

The shale gas industry is also a key target for Aqua Armour sales and the company says its first deployment is imminent. Like mining, fracking requires a vast amount of water and if that water can be captured, treated and reused, then the industry has the potential to save millions of dollars.

In addition, Aqua Guardian has also been working to increase its capability to supply these new markets through partnerships with local companies in international jurisdictions for manufacturing, marketing and deployment of Aqua Armour. The company, it seems, is set for success. ♥

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