

Shepparton High Rate Anaerobic Lagoon Cover Renewal

Goulburn Valley Water has undertaken the upgrade works to the 250ML High Rate Anaerobic Lagoon (HRAL) located at their Daldy road, Shepparton, Victoria waste management facility with an area of 50,000m². The upgrade works include removing the existing cover which has reached the end of its service life, desludging the lagoon, remediating related infrastructure and installing a new cover. The HRAL cover allows the anaerobic processing of effluent, manages odours and allows the produced methane gas to be beneficially used reducing greenhouse gas emissions and providing energy from waste.

The reactor has a unique combination of residential inflows with a high proportion of industrial wastewater resulting in an inflow equivalent to that of a population of 1.1 million. To cater for this the Shepparton Waste Water Flows are processed by a High Rate Anaerobic Lagoon (HRAL).

The lagoon is an earthen basin with a geosynthetic cover which allows GVW to control odour, and enables the harvesting and storage of methane gas, which is either combusted to reduce greenhouse emissions or sold to a third party and used to generate electricity. The Geosynthetic cover provides a durable gas seal at a lower cost than rigid structure alternatives.

The cover has to manage and cope with repeated pressurisation/depressurisation, UV radiation, high temperatures, contact with by-products of the treated waste and attack from wildlife such as corellas. A severe wind storm in 2015 also contributed to the development of a large, 200m tear in the cover as shown in the images below. These assets have a finite life and following a number of maintenance activities it was deemed to be at the end of its service life. There are few anaerobic covers of this size globally and they present a significant challenge to remove and replace. With the interval between cover replacement cycles it is also good practice to incorporate in the replacement project new design and materials developments to optimise performance of the replacement cover. The task to replace the existing cover commenced in March 2020 by Fabtech Australia Pty Ltd.



Shepparton High Rate Anaerobic Lagoon Cover Renewal



Photos above: The tear in the cover is significant, measuring over 200m in length - photo dated 2020

Images above was obtained from <https://www.gvwater.vic.gov.au/projects/current-projects/shepparton-high-rate-anaerobic-lagoon-cover-removal>

Fabtech started the design works in January 2020. The concept design was developed into a detailed design by March 2020. The original cover was a polypropylene material and a number of candidate materials were considered for the new cover. Following extensive analysis high performance 2mm-thick High Density Polyethylene (HDPE) material was selected. HDPE has excellent chemical resistance characteristics, essential in this application combined with excellent UV ageing characteristics and is one of the most robust materials in the industry for this particular use. Fabtech undertook 6 months of rigorous accelerated laboratory testing to demonstrate that the proposed material would exceed the required design life in this application. With these tests and laboratory studies, Fabtech were able to predict the material life expectancy, giving confidence to our Client that the proposed material is suitable in this application and their requirements.

While the original cover was installed onto an inert lagoon the replacement cover had to be installed on the active anaerobic reactor. This presented a number of design, construction and safety challenges. As part of Fabtech's proposal due to the size of the lagoon (148m x 225m), a moving work platform was designed and fabricated by Fabtech to facilitate the overall cover installation process. The moving work platform comprises 48 individual elements, each being 6m x 6m in size and weighing almost 1 tonne each.

Once mobilised to site Fabtech commenced remediation of the concrete edge beam. In the original design the concrete anchoring beam was unprotected and had suffered substantial chemical degradation; hence was required to be replaced or remediated as necessary. The new edge beam design is generally identical to the old design and was constructed adjacent to the out wall of the existing beam, between April and July 2020.

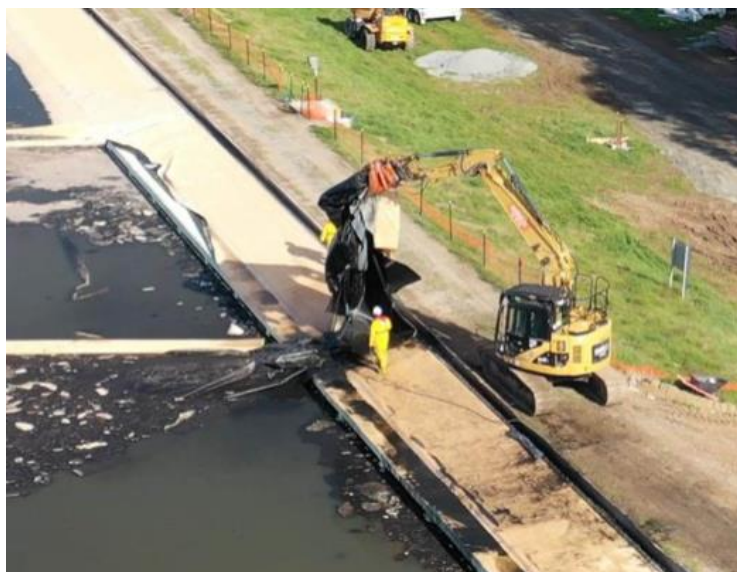
Shepparton High Rate Anaerobic Lagoon Cover Renewal



Photos above: Fabtech Undertaking Concrete Ring Beam reworks and replacement

The construction sequence allowed the new anchoring beam elements to be constructed before the existing cover was removed.

Minimising gas emissions while removing the old cover and installing the new cover was a key objective for the project. A number of project activities were overlapped to compress the “cover – off” duration. As the new ring beam works came close to conclusion, Fabtech commenced removal of the old cover to allow de-sludging of the reactor lagoon



Shepparton High Rate Anaerobic Lagoon Cover Renewal



Photos above: Fabtech Undertaking Cover removal

Following removal of the cover de-sludge of the lagoon could commence. De-sludging barges were installed in the lagoon; achieving on an average of >50 Dry Tonnes of Sludge / Scum per Day. These works extended over a period of approximately 4 weeks With a total of >1200 Dry tonnes removed from the Basin.



Shepparton High Rate Anaerobic Lagoon Cover Renewal



Photos above: Fabtech Undertaking Desludging and Descumming Works

Images above was obtained from <https://www.gvwater.vic.gov.au/projects/current-projects/shepparton-high-rate-anaerobic-lagoon-cover-removal>

Once de-sludging had been substantially completed installation of the new cover started in early October. The design of the new cover divides the lagoon into two zones, namely 'reactor' and 'settlement' zones. These two zones of the lagoon are separated by a gas curtain, allowing them to operate independently of each other. This allowed the construction programme to be structured in two phases so that the reactor zone could be completed and commissioned while the remainder of the cover is being installed. This allowed gas harvesting from the active reactor zone reducing odour emissions at an early stage during construction.

At the time of this report the reactor zone cover has been commissioned and is now operation. Construction of the settlement area cover is progressing.



Shepparton High Rate Anaerobic Lagoon Cover Renewal



Photos above: Fabtech Undertaking Cover replacement stage 1 (Reactor Zone)

Some Images above was obtained from <https://www.gwater.vic.gov.au/projects/current-projects/shepparton-high-rate-anaerobic-lagoon-cover-removal>