

SDP Capital Works Project Summary



Project Title / Asset	Protection of Intermediate Permeate Tanks
Project Driver	Reliability / Durability

Purpose

The purpose of this document is to provide a high-level overview for major projects, further detailed information is available on request. Major projects have been defined as any capital expenditure that includes the addition of new assets to the Sydney Desalination Plant (Plant).

Information/justification on other elements of the proposed capex program (e.g. refurbishments and replacements of existing assets) are available on request.

Project Background

Within the process stream, the Intermediate Permeate Tanks (IPTs) are situated between the 1st and 2nd pass reverse osmosis (RO) trains. Their primary function is to provide holding storage so a proportion of the 1st pass RO permeate can be fed to and treated through a 2nd pass RO desalination process to meet the required final water quality specification. The IPTs are also designed to retain a useable volume for the purposes of flushing and clean-in-place (CIP) cleaning of the RO membranes. The useable volume includes a drawback volume in the event of a sudden stop in the 1st pass RO feed to prevent a vacuum from being drawn via natural osmosis or air being sucked back into the membrane elements – i.e. it provides protection against damage to the system, including membrane elements.

Each IPT, one per module, has a liquid holding capacity of 1,400m³ (1.4ML) with dimensions of 12.80m internal diameter and 12.67m height secured via M20 anchor bolts on a reinforced concrete base.

The tanks are physically located at the northern end of the RO building, fully sealed and shaded from direct sunlight to prevent microbial growth via photosynthesis and heat. Air movements are forced to travel via high-efficiency particulate absorbing (HEPA) filters to always maintain atmospheric pressure within the tanks as liquid level fluctuates.

The tank walls and roof are constructed of glass fused mild steel bolted panels with 8 strakes of 15 panels each ranging from 5mm wall thickness at the bottom and 2mm at the top. The concrete floor also includes the same glass fused steel panels with an added 3mm Sika TS Plus layer fully encapsulating the floor. Each panel is overlapped and secured with an adjoining panel using over 26,000 bolts per tank and sealed with Sika sealant. The plastic encapsulated hot dipped galvanised steel head storebolts are installed on the inside and nut/washer with plastic cover on the outside.

The IPTs were fully replaced in 2017 as part of the Reinstatement Project following the Storm Event in December 2015. The tanks were replaced on a like-for-like basis – the identical design to the original design. The original tanks were 10 years old and showed evidence of corrosion.

During the defect liability period under the Reinstatement Project extensive repairs and works were carried out to protect the tanks from short-term failure – sika-flex mastic was applied to all vertical

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bolt seams and the entire floor coated. The sika-flex mastic will not maintain a service life consistent to that of the glass fused to steel panels (25 years).

This project involves installation of an impressed current cathodic protection (ICCP) system to protect the tanks from corrosion to ensure the asset design life is reached and/or exceeded. A ICCP system is installed on other glass fused steel panel tanks at the Plant such as the thickened sludge holding tanks.

Asset Details

Asset	Intermediate Permeate Tanks, TNK41501-00, TNK42501-00.
Asset durability/ design intent/ asset management Strategy	Durability: 25 years. Design intent: Duty only, minimal maintenance. Asset strategy: Condition Based Routine.
Asset Function/ Subsystem/ System	The IPT is used to store and buffer the RO 1st Pass rear permeate before feeding it into the RO 2nd Pass Process. The height of the inlet into the tanks also provides a constant back pressure to the RO 1st Pass process. The intermediate permeate is also used for service water, flushing and cleaning the RO membranes, along with cooling water for the major RO pumps.
Asset Failure and its consequence	The IPTs are made of glass fused to steel panels with silo bolts. If the coating is damaged the glass cannot be reinstated and requires either steel plates or a bolt with sika-flex mastic coating to repair. Failure of the tank will result in loss of 50% Plant capacity for around one month to repair (due to access requirements and curing time). Replacement of a single tank would take around 6 months to manufacture and erect and cost approximately \$1.5M (excluding removal and reinstatement of building roof to allow for access).

Justification

The 1st pass permeate fluid within the IPTs is considered as a moderately aggressive fluid that will corrode unprotected steel which is electrically connected to the base slab concrete reinforcement. Provided continuity between any tank substrates with breached coating and reinforcement, an ICCP would protect the tank and ensure the design life can be achieved or exceeded.

The ITPs are high value and process critical assets. Prolonging the life of these tanks is prudent to ensure availability and value for money. It has been proposed that the ICCP be installed after 10 years of operation, however the actual timing for installation will be based on tank condition.

The thickened sludge holding tanks are constructed from the same material as the ITPs. These tanks were not replaced during the rebuild, however SDP has already installed a cathodic protection on these tanks due to corrosion and resultant leaks.

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Options Considered

Jacobs were engaged to investigate and provide details for a suitable cathodic protection system including installation methodology and ongoing monitoring for protection against corrosion associated with the IPTs at the Plant. Full details can be found in the Jacobs Technical Memo and can be provided upon request.

The tanks are internally inspected every 3 years to monitor condition. To ensure the maximum asset life can be achieved, it is recommended this project be completed before the tank reaches 10 years of operation or in advance of this should issues with the tank and liner be identified during inspections.

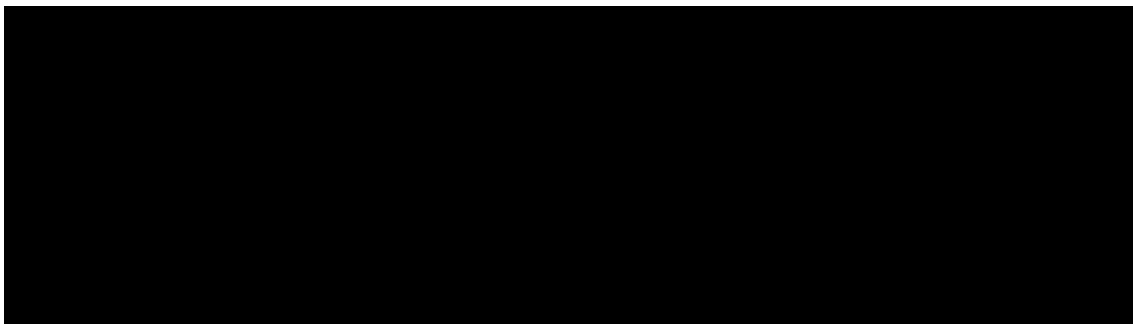
Proposed Scope

The proposed scope of works will include:

- 8-off titanium wire anodes per tank suspended from the tank roof with 2kg weights for stability
- 1-off Transformer Rectifier (TR) unit per tank (mounted at roof level) powered via 240Volt power
- supply and low current alarm communication cabling back to the Plant control system (SCADA)
- Positive charged cabling within flexible plastic conduit connected in a ring main arrangement with junction boxes at each anode to the TR unit per tank.
- Negative charged cabling from nearest cast in ground plate to the TR unit per tank
- Hot dipped galvanised mild steel bars for providing electrical continuity among all panels.
- ICCP system design based on AS2832.4

Cost Estimate

Quotes were obtained by the subject matter experts and preferred contractors engaged onsite. The estimated budget price for the works are as per below (\$ base 2018). The cost has been indexed to the correct basis for including in SDP's 2023-2027 Regulatory Submission.



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Proposed Layout

