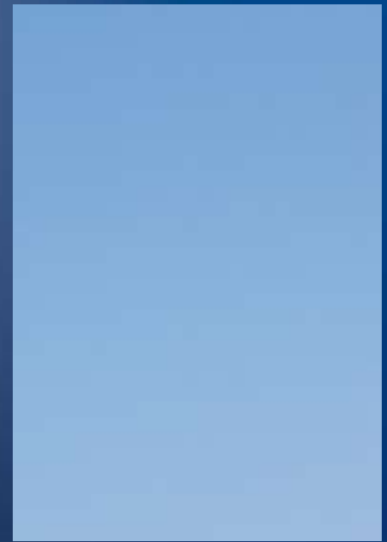




HOCKWAY™

Cathodic Protection for above ground storage tanks





Undertank base/external and internal tank protection.

Hockway can supply corrosion protection for any tank designed to operator and international specifications and standards, whether new build or existing retrofit. We cater our solutions towards tank dimensions, product, coating type and quality, and operating temperature.



Undertank CP Systems

Longer lasting Impressed ICCP systems

Impressed current CP ICCP systems are more reliable, effective and flexible than sacrificial anodes for undertank base protection.

A typical CP Undertank system

The materials required for a typical new undertank ICCP system will include:

- A standard transformer rectifier
- MMO titanium anode material
- Permanent reference electrodes for monitoring
- An undertank tube for ventilation, watering and/or portable measuring

Transformer Rectifiers

Our recommended TR is our standard oil cooled variac control model. However we can provide rectifiers that match the operator's specifications. Typically, oil cooled is for the extreme (hot, cold, dusty) environments. Air-cooled for milder climates or air-conditioned shelters. For hazardous areas we supply ATEX rated TRs.

Hockway can also cut costs by designing cathodic protection systems with dual channel transformer rectifiers to protect either internal and external impressed CP systems or 2 x CP external tank systems simultaneously.

Anodes

For new build tanks with ICCP we recommend MMO (Mixed Metal Oxide) titanium Anodes. These can be laid using a piggyback loop or linear grid array 500mm below the tank base to provide close anode distribution system.

We recommend loop anode layout systems due to the significant benefits they offer. The advantages are the ease and flexibility in installation and later commissioning, and monitoring with greater long term reliability.

Fig 1: Typical Undertank side view layout using the loop system

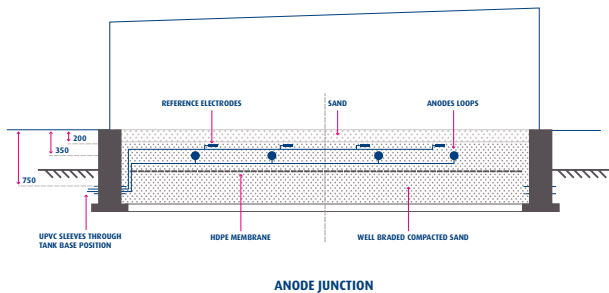
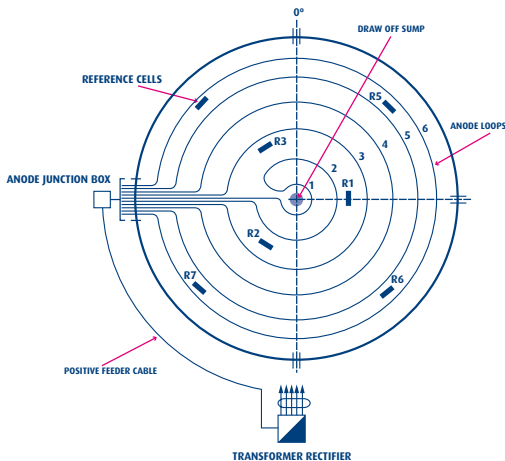


Fig 2: Typical Undertank loop layout



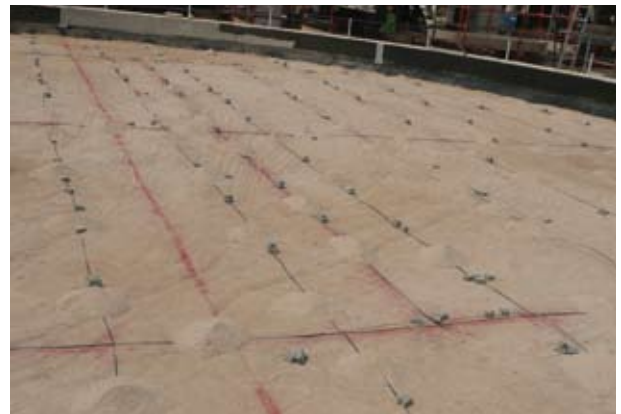
Anode Junction Box

We supply anode junction boxes that can double up as a monitoring box where the reference electrodes and monitoring cable are also terminated and thereby reducing costs.

Reference Electrodes to monitor CP performance

We recommend Copper Copper Sulphate and Zinc reference electrodes are installed for monitoring purposes.

Example of Grid System



Example of Loop System



This image is courtesy of Ceranode

Choosing the external tank CP system – New or retrofit

	Options	Advantages	Disadvantages
System	Sacrificial	Low cost	Limited effect, no increase of output capability, fail prematurely
	Impressed	Reliable, can increase output, long lasting	Higher cost than sacrificial More difficult
Anode Layout	Grid/ribbon	Less expensive than linear, more anode material	Difficult to install, reliant on good connections in the field, sumps problematic with contact to anodes
	Loop/wire	No messy infield connections required, ready to install (out of the box straight in the ground), reduces construction time, sumps can be avoided during construction	More expensive than grid anodes, less anode material
Reference Electrodes	Silver Silver Chloride Reference Electrodes	Ability to measure potentials under the tank	Mixed reliability, subject to drying, more expensive
	Copper Copper Sulphate Reference Electrodes	Reliable in clean sand	Subject to drying
	Zinc Reference Electrodes	Good to compare against other other Permanent Reference Electrode types	Not suitable as stand alone reference

Under normal circumstances with given information scope, Hockway's recommended system is an MMO titanium, loop arrangement with a standard variac controlled TR and permanent Copper Copper Sulphate reference electrodes for potential monitoring. A ventilation / portable monitoring / watering pipe is also recommended.

Internal Tank CP Systems

Choosing Tank Internal Protection

Tank Type	System Type	Information	Typical system
Water Carrier	Sacrificial	Small diameter tanks, Temperature – Ambient, Mid range resistivity	Aluminium, Magnesium or zinc anodes
	ICCP	Large diameter tanks Low resistivity – requires large current High resistivity requires higher voltage High temperatures	Si Fe or MMO Titanium Tubes, MMO/Platinised Niobium Titanium anodes or Copper wire TR driven using auto potential control
Chemical	Sacrificial	Generally not used as products and operating conditions can be particularly aggressive	
	ICCP – Cathodic	High current requirement Easier to control	
	ICCP – Anodic	Suitable for low ph and high temperature, lower power requirements, potential monitoring critical, hard to control, varied success	
Oily Product Storage Tanks	Sacrificial	Used for water drop out	Magnesium or zinc anodes located on tank floor No monitoring devices employed.

Although water varies in resistivity Hockway’s recommended method is using an impressed close anode wire system.

Fig 3a: Typical Internal Tank ICCP System

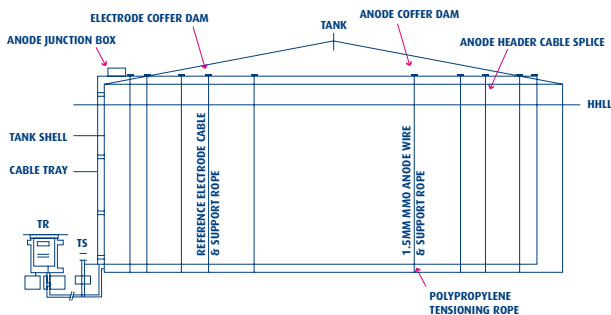
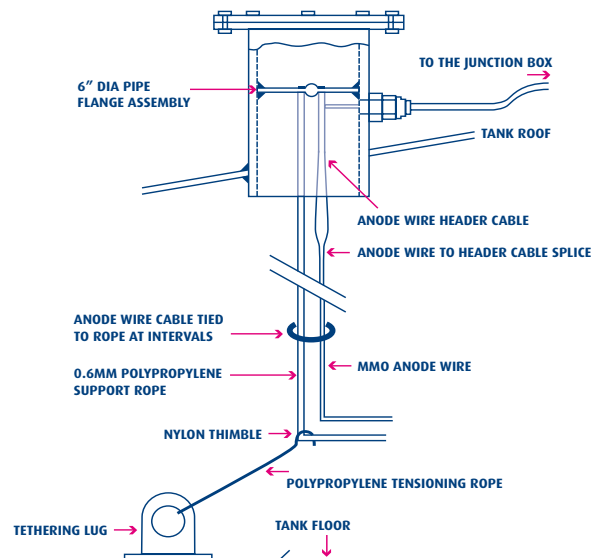


Fig 3b: Anode Cofferdam Assembly



A Typical Impressed CP Internal System

A typical internal tank protection package would incorporate a transformer rectifier, MMO titanium anode material and silver/silver chloride reference electrodes.

Equipment and Materials

Transformer Rectifier

As the tank contents change, so do the current requirements. To prevent under or over protection, we supply auto potential controlled transformer rectifier units.

To save on cost Hockway are able to provide a 2 channel TR to protect both tank internal and external.

Anodes

We recommend MMO Titanium or Platinised Niobium wire anodes especially at the high resistivities, to ensure consistency and uniform protection. For lower resistivities tubes of silicon iron or MMO/platinised titanium anodes can be suspended in the water.

Reference Electrodes

Silver Silver Chloride reference electrodes are required especially if an auto potential controlled TR is employed. The reference potential feeds back to the TR to vary the output depending on product levels.

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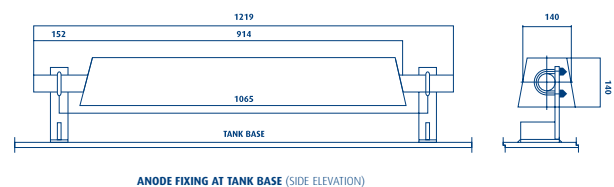
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Sacrificial Systems

We supply aluminium, magnesium and zinc anodes to be distributed uniformly around the tank floor and tank sides.

Hydrocarbon products storage tanks sometimes contain residue of water, frequently saline in nature, that falls out and collects at the base of the storage tank. To prevent corrosion sacrificial anodes should be installed along the tank floor.

Fig 4: Internal Tank Sacrificial Anode Arrangement



Special Cases

Storage tanks can hold products that are very acidic or alkaline in nature. Due to these variations each system is designed on a case-by-case basis.

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