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Storage Tank Corrosion Protection Using SMP VCI Technology



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Abstract

Corrosion Protection of Process Plant and Equipment is a critical task which requires synergistic combination of different corrosion control technologies. Volatile Corrosion Inhibitors (VCI's) have been found highly useful in protection from corrosion for various process equipment during construction, testing, service & storage.

RUST-X VCI's have an advantage of a multi-modal protection mechanism:

1. Evaporating and combining with moisture droplets and protecting in vapor phase
2. Settling on to the metal surfaces and forming a multi-molecular film that inhibits corrosion
3. Dissolution in water and penetration into soil and concrete to reach the rebar and metal and protecting it from corrosion.
4. Forming a mixture with soil/concrete and migrating towards metallic surfaces offering them protection

Due to multiple ways of protection, RUST-X VCI's have been found to effective, beneficial and can be incorporated during the construction phases. These can also be used for protection and enhancing the service life if the provisions for incorporation/injection have not already been made.

The VCI inhibitor is so effective that it can increase service life of tanks by up to 10-15 years. This reduced corrosion rates also provide higher safety, lower risk of accidents, lower risk of accidental environmental releases, reduced maintenance costs and improved economics.



The SMP technology advantage with multi-modal multi-metal protection

RUST-X uses VCI SMP technology for Speedy Moisture Passivation. These VCI's are a mixture of Corrosion Inhibiting Agents which work in Vapor Phase, Contact Phase as well as in Aqueous systems.

Volatile Corrosion Inhibitors have a tendency to evaporate have vapor pressure in the order of 1×10^{-3} mm Hg to 1×10^{-5} mm Hg.

The SMP technology relies upon a mixture of VCI's that evaporate at fast speeds, moderate speeds and slow speeds and protects metal from corrosion starting instantaneously to up to several years.

VCI Dosing Protection Method Old Tanks

Chime Feed

The VCI powder may be dosed around the perimeter of the tank by placing the delivery tube with perforated holes or slots around the chime. The tube is covered with a masking tape or a sealing sheet to keep it in place and also to prevent the powder/slurry to leak out from the tube.

The powder or slurry can be fed into the tube from which it flows into the crevices and gaps under the bottom of the tank. Also the regular breathing action of the tank bottom would assist in suction of this slurry under the bottom plates. This method allows VCI's to effectively reach only a few meters from the walls.

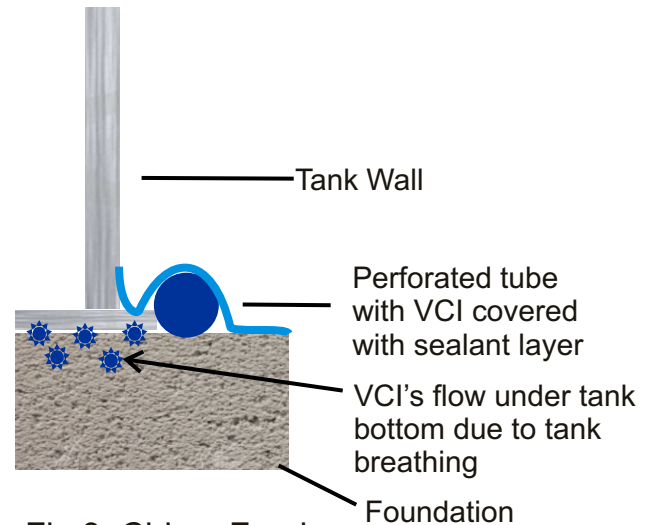
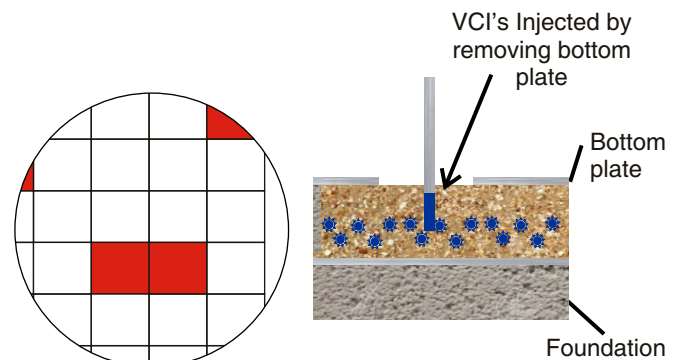


Fig 3: Chime Feed

Bottom Plate Injection System

The VCI's can also be injected under all the floor plates by drilling injection holes in the floor plates or during repair and replacement of the floor plates. The VCI's may be injected using high pressure systems to push VCI powders into the soil bed and create a corrosion inhibiting environment.

A dosage of 1 - 2 kg / 10m² of the powder is recommended into the soil bed in order to have an effective inhibiting system.



The plates that are marked as corroded and that require to be changed are marked and during the change of plates the inhibitors are injected under the plates

Fig 4: Feeding under the tank bottom plates

Underside Injection

A perforated or slotted tube is drilled under the tank bottom and inhibitor fluid is injected as slurry into the sand bed.

The inhibitor is breathed and moved within the sand bed due to normal breathing action of the tank bed and evaporation of the inhibitor fluid within the bed.

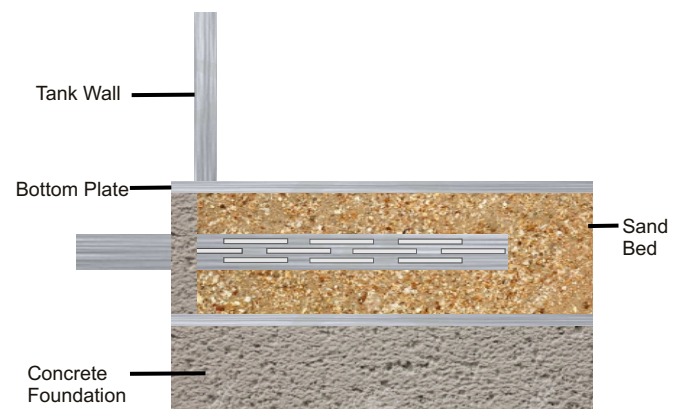


Fig 5: Underside Injection System

VCI Dosing & Protection Method New Tanks

New Tanks- Sand Bed

It is always advisable to use VCI Protection right from the beginning at the time of construction. This improves inhibition efficiency as well homogeneity in the base plate protection.

The VCI Chemicals should be placed closest to the metal surface. Therefore after forming the base of sand/gravel the VCI chemical may be spread on the base at a dosage level of 2 kg/sq meter by manually spreading or sprinkling. The Tank bottom may be directly placed touching this powder for highest effectiveness.

The dosage should be based upon the service life and corrosion inhibition required and should be between 1 - 2 kg / 10m² of the surface area.

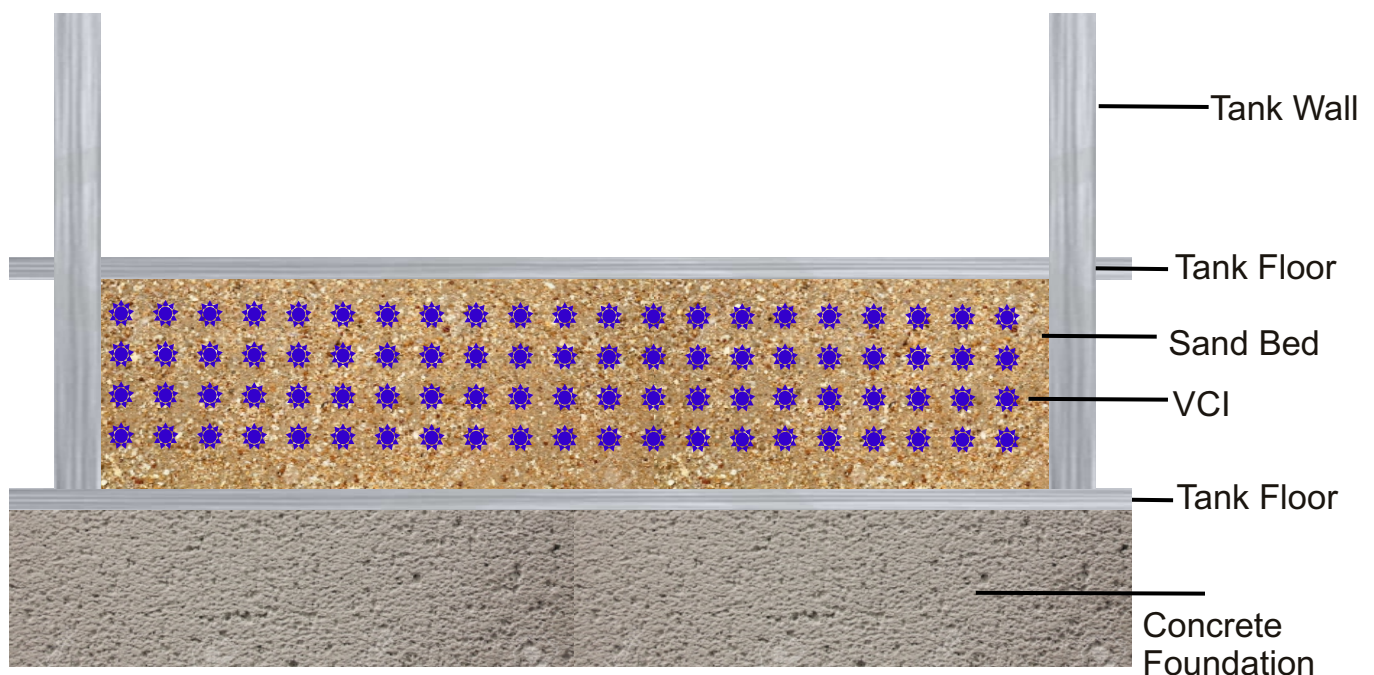
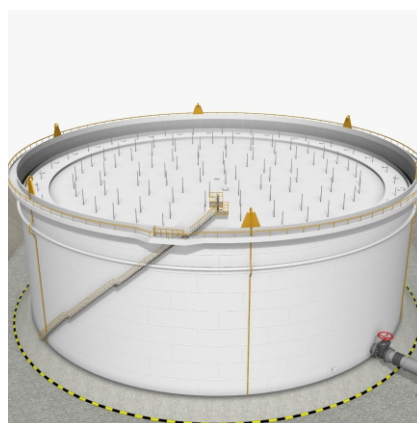


Fig 1: VCI mixing in the sand bed



New Tanks - Inhibitor Distribution System

New Tank beds can be fitted with an Inhibitor Distribution System under the tank bottom. This can be an array of pipes in a ring or spider fashion which can be fed with liquid inhibitors that flow and enrich the sand bed with corrosion inhibitors. These inhibitors vaporise and with the natural diffusion process under the tank bottom, spread and deposit on the tank bottom plate and protect it from corrosion.

The inhibitors are very effective and can create a corrosion inhibiting environment for years. The inhibition efficiency may be monitored with the use of ER probes and the inhibitor replenished when required.

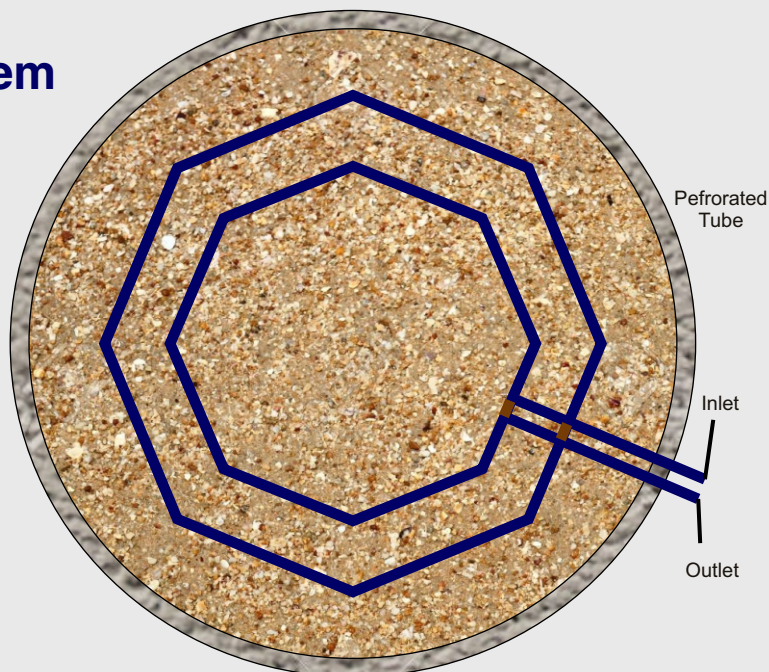


Fig 2: VCI dosage through inhibitor distribution system

RUST-X VCI Products for Tank Bottom Application **VCI 4202 Vapor & Contact Phase Corrosion Inhibiting Powder**

VCI 4202 is a combination of synergistically operative Anti Corrosive VCI's that act both in vapor and contact Phase.

RUST-X uses SMP technology for Speedy Moisture Passivation and the VCI's are a special combination of fast and slow evaporating VCI's for an immediate and long term action.

Metals Protected

The special mixture is a multi-metal corrosion inhibitor and protects a variety of metals such as Ferrous, Aluminum, Copper, Brass, Zinc Platings etc.

Dosage Required

Direct Application: 1-2 kg/ 10 m² as solid powder to be mixed with sand/soil

Fogging: The powder is very fine crystalline powder and can be easily fogged

VCI 4209 Vapor & Contact Phase Corrosion Inhibiting SLURRY

The 4209 is a corrosion inhibiting slurry composed of a carrier liquid & VCI 4202 powder mixture which can be pumped through pipelines and equipment easily and used specially for the Inhibitor Distribution System or during injection in the sand bed.

Metals Protected

The special mixture is a multimetall corrosion inhibitor and protects a variety of metals such as Ferrous, Aluminum, Copper, Brass, Zinc Platings etc.

Dosage Required

Direct Application: 3-4 kg/ 10m²



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