

CREDENTIALS

40+ years of experience
in corrosion prevention.

Client support in 50+
countries.

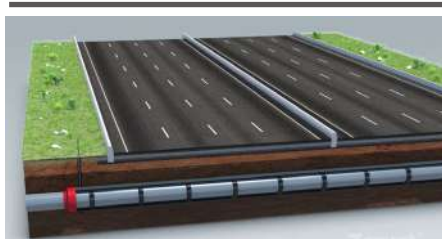
Chair key task group at
NACE International.

MEMBERSHIPS



Zerust Flange Saver®
Zerust ReCAST-R™
2012: Winner of the MP
Readers' Choice NACE
Corrosion Innovation of
the Year award

Protect the Pipe Casing Annulus



Carrier pipes are susceptible to corrosion from
contaminants and/or shorting with the casing

Background

There are hundreds of thousands of cased cross-
ings in North America. Most have been in use for
decades and may be shorted or have significant
contaminants in the annulus.

These contaminants will affect the surface of both
the casing, and more importantly, the carrier pipe.
Regulations recognize the use of VCIs as an appro-
priate method of protecting this vulnerable area.

Designed Solution

Very few cased crossings are exactly the same. As
such, the solution may vary slightly from location
to location. Not only do the volumes vary, but the
concentration of inhibitors can be adjusted based
on cost and longevity between replenishment.

Answers to the variables listed above can be
provided to Zerust and recommendations can
then be calculated and provided by Zerust.

Using VCI to protect pipe casings is a cost-effective
option to extending the life of these important
assets. Corrosion rate monitoring can be
provided using ER probes or coupons. Installation
of the VCI and monitoring equipment, in most
cases, can be accomplished through the vent
pipes without excavation.

Zerust® Pipe Casing

PIPELINE CASING CORROSION PROTECTION

The Problem

Underground pipelines are required to have cathodic protection to
protect them from corrosion. When these pipelines run under road-
ways, railway lines, etc. they have historically been required to have
protective metal casings. Over time, there may be movement of the
product carrying inner pipeline ("carrier pipe") and/or the casing that
brings the carrier and casing into contact. This results in a "metallic
short" that causes the cathodic protection current to pass through
the casing.

The regulatory requirement for pipeline casings with metallic shorts
is for pipeline owners to do one of the following:

- Excavate the buried pipeline, fix the short and resume operations (\$\$\$\$)
- Fill the pipe casing with wax (\$\$)
- Use a Vapor Corrosion Inhibiting gel (\$)

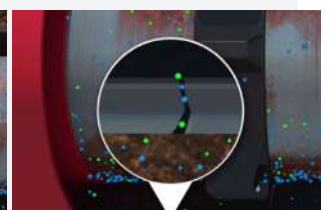
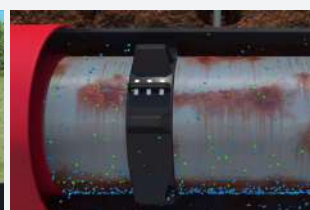
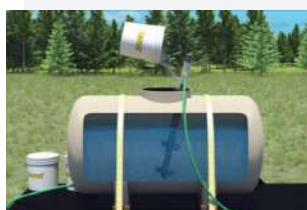
In addition to shorted casings, buried pipe and casing assemblies
typically have trapped moisture, oxygen and other contaminants
that can start the corrosion process inside the casings. These contaminants may also enter
through cracks or gaps in the end seals causing corrosion of the carrier pipe and the casing. Over
time, penetrations in the casing, or end seals, can also contribute to ingress of moisture and con-
taminants. Accumulated moisture can puddle and stagnate, accelerating corrosion.

Current guidelines by NACE (National Association of Corrosion Engineers), SP0200-2014 offers
the option of using Vapor Corrosion Inhibitors (VCIs) as a corrosion mitigation technique.



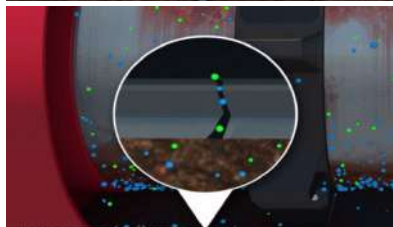
The Solution

Zerust has developed a unique blend of corrosion inhibitors and gels that is injected into the annular pipe
casing space. The Zerust corrosion inhibitors protect the carrier pipeline both in direct contact, using Soluble
Corrosion Inhibitors and also through Vapor Corrosion Inhibitors that protect the entire annulus vapor space.

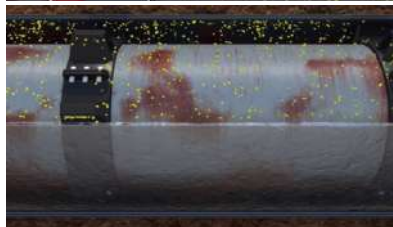




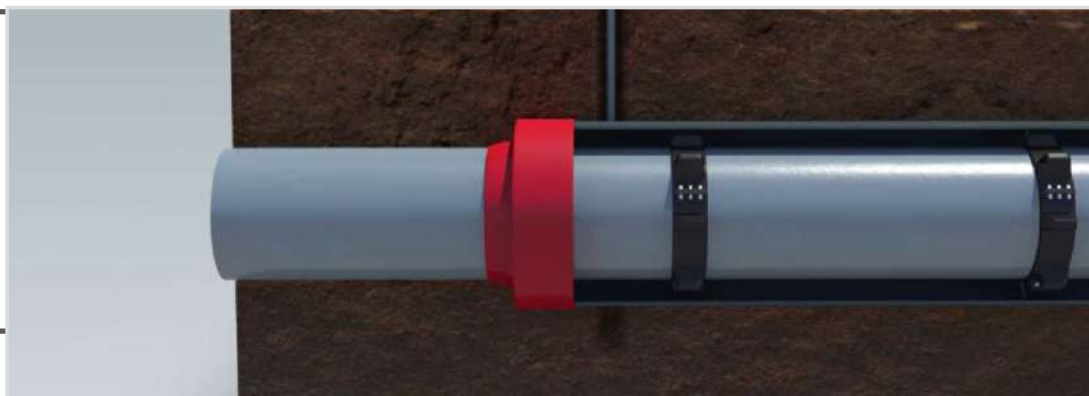
Gel System: Gel crystals are introduced prior to injection through the vent pipes.



Inhibitors neutralize contaminants on contact and in the vapor space of the annulus. The amount of VCI required depends on the volume of the annulus and any contaminants that may be present.



Zerust's FVS product contains both VCI and SCl components. The SCl neutralizes contaminants on contact in the liquid phase while the VCI vapor molecules protect in the vapor space.



How the pipe casing solution works

High Viscosity Gel Application

WHEN: For pipelines with a metallic short (i.e. casing in contact with the carrier pipe) or pipelines where a static fill anti-corrosion solution is needed. This also meets PHMSA requirements for a protection system that remains in place.

HOW: The gel system is installed as a low viscosity slurry which sets up as a high viscosity gel. The VCI molecules volatilize from the gel to protect the vapor spaces in the annulus. The SCl in the product neutralizes contaminants on contact. The gel system has advantages over the other two applications in that, as the gel sets up, it can bridge small penetrations and reduce the possibility of the solution leaking out of the casing. Conversely, it helps slow down the ingress of contaminants from the outside.

Powder Application

WHEN: For pipelines without a metallic short, but for which providing internal corrosion protection is a good operating procedure, Zerust recommends the use of its dry powder inhibitor. As long as there is minimal water ingress (i.e. end seal integrity is maintained) the system will protect the carrier pipe from corrosion.

HOW: A simple blower system is used to blow Zerust's proven blend of Zerion powder inhibitors down into the pipe casing through the casing vent pipes. The Zerion powder is blown down the entire length of the annulus and settles on the bottom of the casing pipe. SCIs neutralize contaminant in the bottom while VCI volatilizes to protect the metal surfaces in the vapor space. The entire annular space of the cased pipeline is protected.

Slurry Application

WHEN: For long lengths of pipe with varying elevations, bends and other geometric/dimensional parameters where a powder or gel is not feasible.

HOW: Zerust's unique Zerion FVS is first mixed with water. Gravity or a low pressure pump is then used to inject the inhibitor slurry through the casing vent pipe into the annular space. The SCl in the product neutralizes contaminants on contact. The VCI molecules are released and equalize in the remaining vapor space, protecting both the exterior of the carrier pipe and inside of the casing. The entire annulus space of the cased pipeline is protected. The liquid injection is especially beneficial for longer casings as long as the integrity of the casing and end seals can be proven.

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Zerust® OIL & GAS

WORLDWIDE CORROSION SOLUTIONS

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