



CORTEC
CORROSION ENGINEERING
& FIELD SERVICES

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Cortec® Corporation:

Now Provides Engineering and Field Services in Addition to its Worldclass Assortment of Corrosion Control Products

Cortec® Corporation of St. Paul, Minnesota has expanded its business and launched a Cortec's Corrosion Engineering and Field Services (CEFS) group. This group is focused on providing each customer with optimum corrosion control solutions to meet their needs. The scope of services for Cortec's CEFS include a variety of corrosion control design, engineering, and field applications serving Cortec® customers worldwide. If you need a service that is not addressed in this brochure or on our website – please contact us - we will welcome the opportunity to assist you. CEFS is committed to providing a cost effective service designed to ensure our customers receive the correct products, technologies, and applications the first time, every time.

The primary focus of CEFS includes:

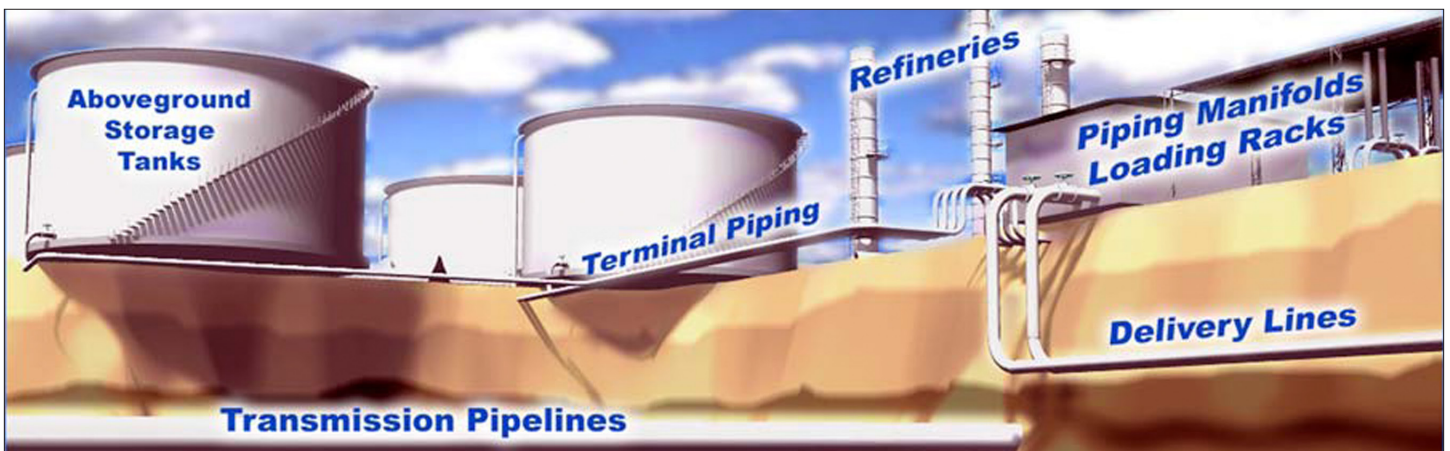
- 1. Delivery of exceptional design & engineering services for development of effective corrosion control solutions and comprehensive corrosion management programs.**
- 2. Delivery of advanced applications and installations of corrosion control systems worldwide.**

Our corrosion control solutions include, but are not limited to, a wide array of Vapor phase Corrosion Inhibitor(VpCI®) delivery systems, high performance coatings and linings, corrosion monitoring as well as cathodic protection alternatives.

CEFS is comprised of internal Cortec resources, plus a substantial group of experts available through Cortec's well developed, worldwide group of licensed distributors and contractors. Together we are able to provide our customers with a sole-source supplier of:

- **Engineered corrosion control solutions.**
- **Technologically advanced corrosion control products and processes.**
- **Safe, professional, and effective delivery of corrosion control services.**

The CEFS team welcomes all opportunities to assist our customers with controlling corrosion of their equipment, plants, concrete structures, pipelines, tanks, etc. in order to extend the useful life of these assets to their practical limits - and beyond.



Engineering Services

Innovative Corrosion Control Engineering & Design Solutions

Cortec's CEFS team works hard for its customers to solve virtually any corrosion control challenge. We are able to utilize a wide array of technologies and resources. Innovation is a specialty and we welcome the opportunity to provide custom designed corrosion control solutions.

Corrosion control system solutions are designed using:

- **The tremendous selection of Cortec® Vapor phase Corrosion Inhibitor (VpCI®) technologies.**
- **Cathodic protection technologies where applicable.**
- **Other corrosion control technologies where applicable.**

Total Facility Corrosion Management Programs

Effective mitigation of asset/facility corrosion begins with well engineered comprehensive programs that are designed to produce coordinated application of the appropriate technologies. Cortec's CEFS group is focused on providing each customer with the optimum corrosion control solutions to meet their needs through organized corrosion management programs.

- **Corrosion Audits.** Comprehensive audits/analysis of individual facility assets that are potentially affected by corrosion. Audits are designed to identify both – areas with satisfactory attainment of corrosion control and areas with corrosion control deficiencies.
- **Baseline Assessments.** This type of assessment is designed to evaluate the effectiveness of operating corrosion control systems/programs and identify any deficiencies or recommended revisions.
- **Corrective Action Programs.** This is follow-up to the previous evaluations. CEFS provides custom turnkey solutions for mitigation of identified corrosion control deficiencies. These programs can be tailored for compatibility with annual budgets as necessary.

Real-time Corrosion Monitoring Programs

Corrosion monitoring can be utilized in many forms. It is valuable for identification of areas where proactive corrosion control systems are needed. It is also important to incorporate effective monitoring of active corrosion control systems in order to ensure their effectiveness.

- **CEFS is committed to designing corrosion monitoring programs that utilize state of the art equipment and technologies to accurately and efficiently monitor real-time corrosion.**
- **Corrosion monitoring systems can be stand alone or in conjunction with existing corrosion control systems.**



Turnkey Corrosion Control Applications

Equipment Preservation

Cortec® has provided turnkey support for many years for equipment preservation projects - now we can provide engineering needed through the final application of all preservation technology and products required to effectively mitigate corrosion during downtime.

- This includes preservation during shipment, storage, temporary shut-down, or long-term mothballing.
- Corrosion protection is provided to all surfaces, both internal and external through the multiple delivery systems available with Cortec Vapor phase Corrosion Inhibitor (VpCI®) technologies.
- VpCI® preservation applications include a variety of cleaning products, surface coatings, powders and liquids for fogging of large spaces, additives for lubricants and process liquids, as well as films for total encapsulation.
- With CEFS, real-time corrosion rate monitoring systems for critical assets are available.
- Assistance with removal of preservation products is also available during future equipment recommissioning.

Plant Layup

Cortec® expertise in turnkey corrosion control engineering by CEFS and applications services for comprehensive lay-ups of individual units or entire plants is augmented with implementation of a comprehensive plant layup package could include:

- A corrosion audit for identification of all facility corrosion control requirements.
- A comprehensive plan to mitigate internal and external corrosion on all plant assets – both above ground and underground.
- Turnkey application of all corrosion control systems.
- Monitoring and maintenance of corrosion control systems during the layup period.
- Future assistance with the transition from the layup phase to plant commissioning.

Control of Embedded Reinforcement in Concrete Structures

Cortec® is committed to enhancing the delivery and utilization of the outstanding array of Cortec® Migrating Corrosion Inhibitors (MCI®) products and technologies available for mitigation of embedded reinforcement corrosion. Turnkey concrete corrosion control solutions include:

- Comprehensive plans for the mitigation of embedded reinforcement corrosion on any type of structure.
- Custom engineered corrosion monitoring systems designed to evaluate the corrosion rates of embedded reinforcement.
- Turnkey application of Cortec's numerous MCI® products on any structures.



Above Ground Storage Tank Corrosion Control

Corrosion control of aboveground storage tanks (ASTs) is a specialty. CEFS offers turnkey corrosion control system designs & installations for virtually any type of AST construction; and for entire facilities where these tanks are located.

- **Baseline assessments can be provided that are designed to evaluate the effectiveness of existing corrosion control systems and identify any deficiencies.**
- **Total corrosion management systems are available for these tanks and/or entire facilities where these tanks are located.**
- **Double Contained ASTs.** Engineered systems utilizing VpCI® technology, in lieu of cathodic protection, have proven to be effective for double contained AST floors. These systems are offered as a retrofit on operating ASTs, or are routinely coordinated with the construction of new ASTs.
- **Single Bottom ASTs.** Cathodic protection systems for single bottom AST floors are available as a retrofit on operating ASTs, or are routinely coordinated with the construction of new ASTs.
- **Monitoring systems are also offered to evaluate the effectiveness of existing and new corrosion control systems while measuring the real-time corrosion rates of the steel surfaces.**

Corrosion Control of Hydro-tested Structures

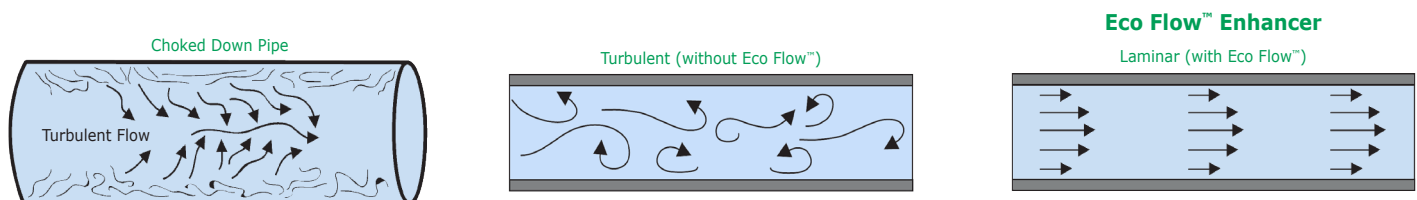
Cortec® has turnkey engineered solutions to control corrosion within vessels and pipelines during the hydro-testing process.

- **If desired a comprehensive program can be structured to provide corrosion control while water is inside the asset, then also after the water is drained.**
- **Corrosion control solutions are available for any type of water used during the hydro-test, including salt water.**

Application of Eco-Flow Technologies to Wells and Flow Lines

Cortec®, also is able to provide an engineered solution to flow enhancement within depleted oil fields and pipelines carrying 10% or greater water. The basis of this solution revolves around the utilization of Cortec's Eco Flow™ system.

- **The Eco Flow™ system is an optimal combination of flow enhancing and corrosion-protecting products allowing increased throughput, along with the unique effect of VpCI® protection, for pipelines carrying water or a mixture of water and hydrocarbons.**
- **Custom designed injection skids are also available.**



Pipeline Corrosion Inhibitors

Engineered systems utilizing Cortec's unique (VpCl®) technologies are available to control internal corrosion in pipelines transporting most liquids or gases.

- **Internal pipeline corrosion control solutions are available for a wide range of refined hydrocarbons, crudes, and oil/water mixes.**
- **Solutions are also available to provide effective internal corrosion control in natural gas production and transmission lines. These non-emulsifying formulations also provide corrosion mitigation in “sweet/sour” saturated carbon dioxide/hydrogen sulfide environments.**
- **VpCl® products form an effective corrosion inhibiting barrier for both ferrous and nonferrous metals in the presence of water, halogens and corrosive gases such as dissolved oxygen, sulfur dioxide, carbon dioxide, and hydrogen sulfide.**
- **The vapor phase component provides corrosion protection in pipeline headspaces and areas not directly contacted by the pipeline products.**
- **Solutions for high temperature products available.**
- **Real-time corrosion rate monitoring systems are also available.**

Corrosion Control of Process System Components

Comprehensive packages of engineered solutions are available, to continuously mitigate the wide variety of corrosion challenges for all types of process system equipment. Our capabilities include:

- **A corrosion audit for identification of all facility corrosion control requirements.**
- **A comprehensive plan to mitigate internal and external corrosion on all plant assets – including above ground / underground; and ambient / high temperature components.**
- **Turnkey application of all approved corrosion control systems.**
- **Monitoring and maintenance of corrosion control systems.**

Surface Coatings

Utilization of Cortec's advanced suite of coatings products containing VpCl® technology provides us with unique solutions for surface coating challenges.

- **Both temporary and permanent coatings programs can be provided.**
- **Coatings systems that do not require sandblasting or other rust removal provide interesting options.**
- **Custom colors are available.**



Use of Corrosion Inhibitors for Control of Corrosion in Double Bottom AST's.

Double bottom tank installations, and tanks with HDPE liner containment, often create unique corrosion control challenges. Many years of experience have proven that control of corrosion, by cathodic protection, of tank bottoms that are separated by a distance of less than about 10 to 12 inches is problematical. Cathodic protection systems are also nearly impossible to maintain, install or replace on a retrofit basis once this type of tank is in service.

Research and fieldwork indicates that corrosion control can be achieved using Vapor phase Corrosion Inhibitors (VpCI®) within double bottom or lined containment environments. Real world experience utilizing VpCI's for void space corrosion control over a 15-year time span has confirmed the longevity of this approach. Corrosion inhibitors are effective alone or in combination with CP. Inhibitors have a long history of corrosion protection under numerous types of conditions (wet corrosive environments and void spaces).

Corrosion Mitigation with Corrosion Inhibitors

Corrosion Inhibitor Basics

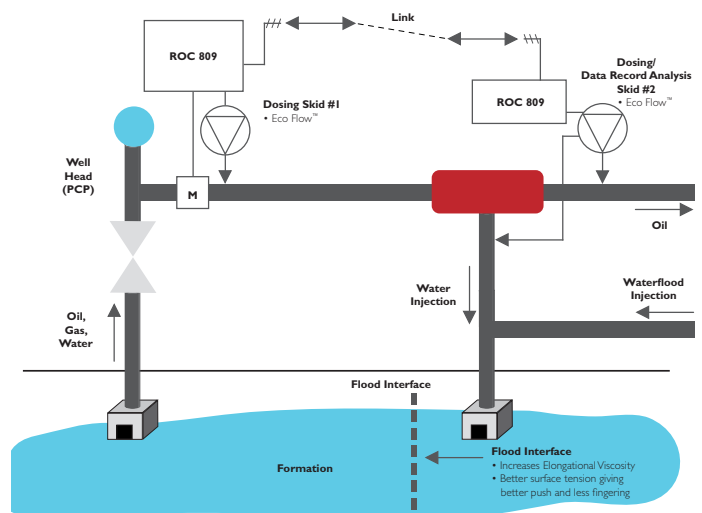
Vapor corrosion inhibitors have been used for many years to solve the basic corrosion control problem for metal surfaces in a confined space. Inhibitors have been used by the oil and chemical industry for over 50 years, minimizing difficult corrosion problems. For over 30 years Cortec® Corporation has investigated these compounds and developed a series of low toxicity inhibitors. A key characteristic of these materials is that they protect against corrosion in the presence of water, vapor, chlorides, hydrogen sulfide, sulfur dioxide, nitrogen oxides, and other compounds found in a corrosive industrial environment.

Services to Industries Worldwide

Many of the Services and applications provided by Cortec® are listed below. Please contact us with interest in these; or with any corrosion control needs.

Oil & Gas - Upstream

Innovative Corrosion Control Engineering & Design Solutions
Facility Corrosion Management Programs
Corrosion Monitoring Systems
Equipment Preservation
Plant Layup
Control of Corrosion Under Insulation
Aboveground Storage Tank Corrosion Control
Corrosion Control of Hydro-tested Structures
Application of Eco-Flow Technologies to Wells and Flow Lines
Pipeline Corrosion Inhibitors
Corrosion Control of Process Systems
Surface Coatings



Oil & Gas - Downstream

*Innovative Corrosion Control Engineering & Design Solutions
 Facility Corrosion Management Programs
 Corrosion Monitoring Systems
 Equipment Preservation
 Plant Layout
 Control of Corrosion Under Insulation
 Above Ground Storage Tank Corrosion Control
 Corrosion Control of Hydro-tested Structures
 Pipeline Corrosion Inhibitors
 Corrosion Control of Process Systems
 Surface Coatings*



Concrete Structures

*Innovative Corrosion Control Engineering & Design Solutions
 Facility Corrosion Management Programs
 Corrosion Monitoring Systems
 Control of Embedded Reinforcement in Concrete Structures*

Process Industries

*Innovative Corrosion Control Engineering & Design Solutions
 Facility Corrosion Management Programs
 Corrosion Monitoring Systems
 Equipment Preservation
 Plant Layout
 Control of Embedded Reinforcement in Concrete Structures
 Control of Corrosion Under Insulation
 Above ground Storage Tank Corrosion Control
 Corrosion Control of Hydro-tested Structures
 Pipeline Corrosion Inhibitors
 Corrosion Control of Process Systems
 Surface Coatings*



Military Installations Worldwide

*Innovative Corrosion Control Engineering & Design Solutions
 Facility Corrosion Management Programs
 Corrosion Monitoring Systems
 Equipment Preservation
 Plant Layout
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 Control of Corrosion Under Insulation
 Aboveground Storage Tank Corrosion Control
 Corrosion Control of Hydro-tested Structures
 Pipeline Corrosion Inhibitors
 Corrosion Control of Process Systems
 Surface Coatings*



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