



Environmentally Safe VpCI/MCI Technology

October 2005

Greetings and Welcome to Our Brand New Edition of Leading Edge!

BREAKING NEWS!

2005 Specialty Plastic Films Technology Innovation of the Year Award Recipient: Cortec Corporation

The Frost & Sullivan 2005 Technology Innovation of the Year Award recognizes Cortec's development of an innovative, environmentally friendly, corrosion inhibiting, biodegradable packaging film that is designed to protect sensitive instruments, controls and electronic systems from corrosion and electrostatic discharge (ESD).

DEVELOPMENT OF "GREEN" PRODUCTS MEANS ENVIRONMENTAL AWARENESS AND CONCERN

Dear Friends,

This fall you will see us adding quite a few newly developed products to the website and brochures, some of which are introduced in this Newsletter.

The majority of our development work belongs to the field of "green chemistry" products. "Green chemistry" is not an absolute goal or destination, but a dedication to the process for continual improvement, wherein the environment is considered along with the performance. Chemical products should be designed to preserve the effectiveness of function, while reducing the impact on the environment. They also need to be designed so that in the end of their application, the product doesn't persist in the environment, and it should break down into innocuous degradation products. The development of "green" corrosion inhibitors is a process, which requires the knowledge of the pertinent country regulations, the evaluation of the environmental performance for the environment to which the product will be exposed, and the excellent corrosion protection in the applications this inhibitor is designed for.

In Cortec's laboratory we are using different approaches to obtain a required or an improved environmental profile:

1. Replacement of solvent- or oil-based carriers in formulations with water-based technology.

We continuously develop new water-based products - substitutes for hazardous oil- and solvent-based. Most of our surface preparation products, coatings, some of metalworking fluids, and MCI-line products are water-based.

2. Replacement of petroleum-based carriers with the solvents, manufactured from renewable resources. This has been accomplished by combining VpCIs with soy-derived oils to formulate anticorrosion products for many different applications.

For years the chemical industry has relied on petroleum as an ingredient in thousands of products. Numerous industrial product manufacturers use petroleum or petroleum-derived substances in their formulations. However, the oil and gas are the focus of today's energy concern, and their prices are also increasing by drastically. Tighter environmental regulations continue to put pressure on oil-based products and their users. These are the reasons why the use of renewable biobased products provides not only environmentally safe alternative to the manufactures and users, but also offers comparable performance, economics and biodegradability of the final products.

Our EcoLine products developed a few years ago (EcoLine Cutting Fluid, EcoLine Cleaner Degreaser, EcoLine Rust Preventative, EcoLine All Purpose Lubricant, EcoLine Greases, etc) are well known by our customers for their excellent performance along with environmentally safe profile. In this newsletter we will present some of our new developments in this product line.

3. Use of biodegradable polymeric materials. We are proud to say that our 100% biodegradable and compostable films: EcoFilm, EcoWorks, EcoCorr, EcoCorr ESD, - are replacements for non-biodegradable films and starch already used for many applications, when environmental issue is a concern.

In this newsletter you will learn about our new additions to this excellent modern line of the products.

4. Use of biodegradable materials obtained from the natural resources as corrosion inhibitors.

For example, for the last few years, we have developed organic corrosion inhibitors from the fermentation products of sugar beats. These products are well known by you. Here are some

of them: MCI-2005/2005NS, MCI-2006/2006NS, MCI-2020M, VpCI-645 and others.

In this newsletter we are presenting a very unique product - antiscalant/corrosion inhibitor based on the protein portion of the soybeans (S-14 Bio).

In this fall addition of the "Leading Edge" we are introducing seven new products that cover a wide range of applications and means of delivery. We also share with you latest news from the laboratory, our publications and presentations, our involvement in the quality process, and State of the Art new equipment installation which has taken place in our production and laboratories.

Have fun!

Margarita Kharshan
Laboratory Director

NEWSWORTHY

10th European Symposium of Corrosion and Scale Inhibitors
The 10th SEIC took place at the University of Ferrara, Italy, on August 29th - September 2nd 2005.

These Symposiums have been held since 1960 thanks to the dedication of Prof. G.Trabanelli, F.Zucchi and their Team at the Corrosion Study Centre "Aldo Daccó" in the Department of Chemistry of the University of Ferrara.

The Symposium was attended by a large representation of scientists from all over the world. Cortec has continuously participated in the Symposium since 1975 with array of papers on Vapor Phase and Migrating Corrosion Inhibitors. In fact, the paper titled "Some aspects of Vapor Phase Corrosion Inhibitors for the protection of steel products" by B.A.Miksic et al presented at 1980 SEIC has become a "classic" paper referenced by researchers worldwide dealing with fundamentals of VpCI technology.

Dr. Margarita Kharshan and Dario Dell'Orto participated on behalf of Cortec Corporation. It is interesting to note that Cortec, represented by President/CEO Mr. Boris Miksic, was among one of the first Companies attending the Symposium in the early 70's.

Numerous papers related to the basic research of corrosion inhibitors, their reaction mechanism as well as their use in a vast variety of applications were presented.

Great interest was generated by the presentation of Dr.Kharshan on Cortec's R&D Lab work on a new generation of Vapor Corrosion and Scale Inhibitors formulated from Biodegradable and Renewable Raw Materials.

The Symposium also offered an excellent occasion to share experiences with other researchers all having the common goal to "tackle and stop" as soon and as much as possible the devastating effects of corrosion.

**NEW PRODUCTS AND
CURRENT EVENTS IN THE WORLD OF
CORTEC ADDITIVES**

VpCI-705 Bio

“Minnesota law accelerates the move to renewable soybean fuel”. [St. Paul Pioneer Press, September 28, 2005]

Do you know that Minnesota will become the first state to require that all diesel fuel contains a minimum of 2% biodiesel, a renewable fuel made from soybeans? This is only the start, because it is fair to say that renewable energy is something that we are really stepping up in different countries and regions.

VpCI-705 Bio is a new additive developed in Cortec Laboratories. This additive brings a powerful corrosion inhibitor to control the corrosive characteristics of biobased fuels. VpCI-705 Bio additive incorporates Cortec patented Vapor phase Corrosion Inhibitor technology to provide protection in all 3 bio-fuel phases: liquid, interface, and vapor phases above and below the fuel level. Being developed with soybean oil as a carrier, it can be added to a variety of bio-fuel and regular types including diesel and gasoline during operation, storage, transport and during distribution.



Unprotected



Protected with
VpCI-705 Bio

VpCI-705 Bio offers multi-metal protection for all common engineering metals used in fuel systems including aluminum, aluminum

and zinc die cast, tinplate, copper, brass, ferrous alloys, cast iron, solder and steel. It brings full corrosion protection to lines, tanks, pumps, carburetors, and upper engine cylinder components. Its three phase action protects upper cylinder walls, piston heads and rings during intermittent equipment and vehicle shutdown periods to minimize start-up concerns.

As a multi-functional additive, VpCI-705 Bio provides excellent corrosion protection, emulsifies water in tanks and fuel lines, and acts as a fuel stabilizer to enhance engine performance. It is

easy to blend liquid that does not contain trace metals, chlorides, chromates, nitrites or phosphates.

The development of this product like many other “Green” products in our laboratory shows how proactive we all must be in our efforts to be ready today and for the future!

S-14 Bio

**Combines Scale & Corrosion Control for
Cooling Towers and Systems**



Utilizing Cortec Advanced Green Technology, S-14 Bio offers a new bio formulation for scale and corrosion control in cooling towers and other open-loop, recirculating cooling systems. The product is comprised of non-toxic and readily biodegradable ingredients. The main component in S-14 Bio is a low molecular weight natural polymer (protein portion of the soybeans) and all other components are GRAS (Generally Recognized as Safe) substances and food approved preservatives. The readily biodegradable formulation is effective in a variety of open and closed systems at low dosages.

S-14 Bio provides powerful scale inhibition and excellent multi-metal corrosion protection. In contrast to conventionally used antiscalant products that offer no or limited multi-metal corrosion protection, S-14 Bio protects carbon steel, galvanized steel, aluminum, copper, and other non-ferrous metals.

Corrosion tests were run in comparison with typical antiscalants such as phosphonates, polyacrylates, and polyaspartic acid. The Half immersion test was used on carbon steel, aluminum, galvanized and copper to evaluate the corrosion protection offered in the liquid phase, the vapor phase and the water-air interface of a cooling system. It was found that typical antiscalants provide limited degrees of corrosion protection while S-14 Bio showed excellent protection for all metals mentioned above.

New Faces in the Laboratory



Deb Heroff
Quality Technician

Brian Benduha
Lab. Technician



Bill Poganski
Coating Chemist

Andrea Kienitz-Hansen
Technical Service Engineer



Without offering true multimetal protection, the conventional antiscalants require supplemental corrosion inhibitors to protect a cooling system. Supplemental inhibitors can introduce both compatibility concerns and changes to the safety and biodegradability characteristics of a treatment formulation. S-14 Bio is specially designed for compatibility with commonly used water treatment programs. It provides a strong building block in cooling water treatment systems for incorporating antiscalants that offer biodegradable properties and excellent multi-metal corrosion protection.

Eco-Tie™ **High Performance Biodegradable Tie**

Eco-Tie is the latest addition to the line of biodegradable polymeric materials.

Until exposed to microorganisms or similar environments, Eco-Tie will remain stable. While in use, Eco-Tie remains strong and usable until exposed to microorganisms, or excessive UV exposure. Moisture and heat alone will not degrade Eco-Tie under most conditions. However since moisture and heat allow microorganisms to become more active, these factors can indirectly reduce the useful life of the product.

Eco-Tie is high-strength, completely biodegradable/compostable (per ASTM 6400 standards) alternative to twine and metallic/plastic ties used in agricultural and industrial markets. Unlike metallic and plastic ties, Eco-Tie will biodegrade rapidly when exposed to other organic materials, but will retain strength while in use. This unique and proprietary technology technology was designed specifically for vineyards where the

grape plants are tied to metal wire and fences during their growing cycle. By using Eco-Tie, wine producers are able to further minimize the environmental impact of their production. This polyester-based product is specifically engineered to be directly consumed by microorganisms when it's in direct contact with soil or compost. When Eco-Tie is in use, it typically is not in direct contact, therefore biodegradation will only begin when it is disposed or discarded.

The materials Eco-Tie is made of are certified for commercial compostability by BPI (Biodegradable Products Institute) and Din Certco (certification company for Europe) per ASTM D 6400, offering consumers confidence that Eco-Tie will biodegrade rapidly and safely when disposed of properly. When Eco-Tie is disposed of in commercial composting environments, it is directly consumed by microorganisms and converted naturally into carbon dioxide and water, typically within 45-60 days. When disposed of in soil the rate of biodegradation is dependent on the soil content and conditions such as temperature and moisture, but typically occurs in 60-365 days.



The most common application is to use Eco-Tie to support young plants and samplings during the initial growth periods of several months to several years. By using Eco-Tie to secure young plants to stakes, fences or similar structure, the stems are less susceptible to environmental damage. Additionally, Eco-Tie can be effectively utilized to direct growth patterns for all

types of plants or as an alternative tie/closure mechanism for shipments and packaging of all sorts.

NEW SHRINK FILMS DEVELOPED

EcoShrink Film

A new product in the Cortec Corporation line of products is EcoShrink Film. EcoShrink film is a 100% compostable/biodegradable film, with the added advantage of being a shrink film. EcoShrink film can now be used as skin film providing a skin tight fit with a semi-transparent appearance and at the same time, becoming space saving, unlike bulky plastic bags. Simply wrap your item in EcoShrink film and apply heat.



EcoShrink film is a product based on EcoFilm, and is a Din Certco and BPI (Biodegradable Product Institute) certified 100% biodegradable/compostable film, designed to replace non-

degradable, as well as starch and polyethylene-based films. Unlike standard starch based technology, EcoShrink is heat and water stable and does not disintegrate or break apart while in use.

The next step in this development process will be EcoCorr Shrink film. Read about this in the next newsletter.

VpCI-125 ESD Shrink Film

Cortec VpCI-125 ESD Shrink film and bags are unique in their ability to serve in three ways: prevent corrosion, ESD damage, and forms a transparent skin-tight covering around your object. This film combines the latest plastic technology with the most effective corrosion protection for

different metals and strong static dissipative properties. Cortec VpCI-125 ESD Shrink films and bags replace conventional rust preventatives such as oils and desiccants. You save even more because Cortec VpCI packaging eliminates all the degreasing or coating removal required in the past. Your product can now be used immediately.

VpCI-125 ESD Shrink film and bags effectively protect components from electrostatic discharge. VpCI-125 meets Type II requirements under MIL-PRF-81705D (Static Dissipative Packaging Materials). The static dissipative properties of VpCI-125 Shrink film are humidity independent; its unique composition does not require the presence of moisture to function.

VpCI-125 Shrink film doesn't contain free amines, phosphates, silicones, and other harmful materials. In addition this film has excellent shrink values, it shrinks in machine directions about 65% and in cross directions - 22%.

VpCI-125 ESD Shrink film is recommended for packaging of static-sensitive and nonstatic sensitive components where triboelectric charge generation and corrosion are concerns. It is recommended for packaging of integrated circuits, printed circuit boards, PCB components, telecommunications equipment, electronic and electrical panels and enclosures, and for many other applications.

OUR NEW WATER-BASED ADDITIVE PASSED OFFSHORE REQUIREMENTS

M-95 is a very low foaming, water soluble corrosion inhibitor additive. Like most of Cortec's additives, M-95 provides multimetal protection and is very active in both phases: contact and vapor.

Congratulations to the Happy Couple!

Our Andrea Kienitz and Mark Hansen got married October 8th. The future looks bright for both of them and everyone here at Cortec wishes them the very best!



We recommend using M-95 when official environmental approval for the application is required. This product can be used in many different situations as an anticorrosion additive to:

- anti-freeze ethylene glycol/water formulation (passes ASTM D-1384-87 Standard Test Method for Engine Coolant in Glassware)
- alkaline metal cleaners (pH 6 and above)
- water-based lubricants
- water-based hydraulic fluid for sub-sea applications
- industrial cooling towers
- water-based paints
- synthetic coolants and cutting fluids

M-95 is biodegradable, and it is in compliance with HOCNF (Harmonized Offshore Chemical Notification Format) environmental requirements.

NEW SOLVENT- AND OIL-BASED PRODUCTS

Super Penetrant Loosens Frozen Parts from Heavy Rust

Cortec VpCI Super Penetrant offers a deep penetrating formulation that loosens frozen parts locked in rust. Its deep penetrating capabilities allow the user to go through as much as 1/2 inch of rust in 30 minutes. The super penetrant can be applied by a variety of convenient methods to meet any application needs including brush, squirt, hand pump spray, aerosol, and spray gun. It is designed to free rusted components such as chains, hinges, linkages, nuts and mechanical assemblies where traditional penetrating oils and solvents are not effective.

As the new Cortec Super Penetrant breaks through deep rust, it displaces moisture and water. Its superior surface wetting and moisture displacing properties allow it to spread rapidly to get underneath the moisture layer normally present on metal under atmospheric conditions.

While loosening the rust, it lubricates metal so frozen parts can move freely. Utilizing patented Cortec VpCI technology, the Super Penetrant forms an ultra thin film on metal that offers protection of up to three months against re-rusting and further corrosive attack.

Cortec VpCI Super Penetrant can be used for indoor and outdoor applications. Its superior water displacing characteristics make it an ideal choice for jobsite applications for equipment and components that are exposed to outside weather. The new product conforms to Federal Specifications for VV-P-216 Penetrating Oil For Loosening Frozen Metallic Parts and ASTM D 971 Test for Interfacial Tension of Oil Against Water.

VpCI Super Penetrant outperforms the most popular conventional penetrants.

This product is available not only in pails and drums, but also in aerosol packages.

Cortec M-530 Anticorrosion Additive to Hydraulic and Gear Oils

We are very proud to announce M-530 - a new corrosion inhibitor for the lubricating oils formulated in Cortec's lab. Based on aminocarboxylate chemistry, M-530 is compatible with a majority of mineral- and synthetic-based oils, including iso-paraffinic, PAOs, etc.

M-530 was evaluated in a wide variety of hydraulic and gear oils of different viscosities and chemical origin. This study confirmed that M-530 effectively improves corrosion protection of the oil, provided the product with ability to displace chloride ions from the metal surface, prevent high temperature oxidation and corrosion of yellow metals. What makes this additive very effective is that M-530 does not negatively affect, but can actually improve demulsification and water separability from the oil. The latter is extremely important for additives to lubricants that could be in contact with waters during operation or storage. In addition to all of the above M-530 is very economical, suitable for both operating and intermittent use, and non-flammable.

M-530 is thermally stable, provides long lasting corrosion protection and can also be recommended for use in oils that have filterability requirements.

NEWS FROM THE FIELD

Coatings Applications in the Oil and Gas Industry

Recently, Cortec has had excellent sales growth in our high performance coating line. One area of growth is the oil and gas industry. We have been successful in refurbishment of both platforms, and tank farms. Our VpCI-396 (primer) and VpCI-386 (finish coat) has provided a very cost effective, high performance coating system that is easier to apply than previously utilized system.

Historically, a three coat system was used that encompassed a zinc rich primer, an epoxy intermediate coat, and a urethane finish coat. By changing to the two coat system, they were able to reduce the labor and material cost while maintaining an effective corrosion resistant system.

The coatings system incorporates our vapor phase corrosion inhibitor technology that allows the coatings to be applied at a lower dry film thickness while achieving increased performance.

In addition to the VpCI-396 and VpCI-386 the coating applicator used VpCI CorrVerter in areas that proper surface preparation was not possible. This product converts a corroded metal surface to a passivated surface that can be immediately painted. This also allowed for a reduction in labor, as the surface was not required to be sandblasted.

Overall, the VpCI coating system will provide a long lasting, cost effective and environmentally friendly system that is desirable to coatings applicators and specifiers.

HIGHEST QUALITY OF PRODUCTS FOR OUR CUSTOMERS

ISO 9001 and 14001 Programs

Cortec has been ISO certified since 1994. Our quality system is well managed and is successful because we all work as a team here. This year external audits performed by BVQI for our 14001:1996 certificate resulted in only one minor non-conformity and for our 9001:2000 certificate no non-conformities!. We are very proud to have achieved such success. We were also commended on the high level of quality of the products we manufacture. Over the years the ISO 9001:2000 standard has made changes that put more emphasis on customer satisfaction. Our dedication to customer satisfaction shows, and the R&D Laboratory takes pride in its commitment to the quality of both product and services provided to our customers. Quality assurance is built right into our laboratory processes before product development even begins. We work hard to continually improve existing products and to develop new and innovative products which are of the highest quality.

ISO 14001 programs at most companies focus on waste elimination and conservation of resources and Cortec initially designed our program in that manner. Several years ago the focus of Cortec's program was changed to emphasize the development of corrosion inhibiting products based on sustainable resources such as soybean oil and gluconates from sugar beets.

Both of these programs represent a long-term continuous improvement program at Cortec that has benefited our customers and Cortec.

Art Ahlbrecht and Debbie Hannan

Q&A

By Brian Wuertz, Technical Service Supervisor

There are some questions that are asked repeatedly by Distributors and others outside Cortec Corporation that I decided to share with you

Question: Why do I have to let VpCI-377 (or other water-based rust preventative) dry before putting it into the bag?

Answer: VpCI-377 provides protection by forming a film on the surface of the part that is approximately 3 microns thick (less than a tenth of a human hair). This film is virtually invisible to the human eye when properly applied and forms a tenacious film. However this film forms as the VpCI-377 is allowed to dry on the surface of the parts as the water evaporates from the VpCI-377. The film will not form if the parts are packed wet or the liquid is blown off the surface for any reason.

Question: How long will my parts be protected if they are in a VpCI-126 Blue Bag?

Answer: The short answer to this question is "it depends". The VpCI-126 Blue film PDS states: "Sealing your product in Cortec VpCI films protects metal parts from all types of corrosion including rust, tarnish, stains, white rust and oxidation for up to 5 years". This is correct, VpCI-126 Blue film will protect UP TO 5 years in ideal conditions, but less than ideal conditions will affect that performance. The best answer for this question is more questions to the customer, so that the proper information can be gathered and the right recommendation can be made. So, if you get asked this question, feel free to pass this person to technical service. We are here to answer those types of inquiries.

FOR A WORLD CLASS COMPANY, A STATE OF THE ART PRODUCTION AND LABORATORIES

Expanding Production Capacity and Possibilities at Cortec Head Quarters

by Ed Berges, Purchasing Manager

This year Cortec Corporation Headquarters has purchased several new pieces of production equipment to increase capacity, shorten lead times and open doors to new product possibilities.

A custom engineered unique reactor will increase production of best corrosion inhibitor on the market VpCI-609 by more than three times the present capacity. This piece of equipment is presently being constructed on site and is projected to be in service in early November 2005. This unit took 8 months to design and fabricate and has computer controlled reaction kinetics. The next piece of equipment to arrive at Cortec is a high speed packet fill and seal machine to produce Cor-Pak 1-MUL. This machine will assume production of this product and make possible to introduce new products in a packet format. Implications for private label customers are limitless.

Plans have been approved for a stainless steel 10,000 gallon reactor which will blend high volume liquid products. This new reactor is estimated to be installed mid November and will make tanker quantity orders a snap. With freight costs on the rise bulk shipments are even more effective.

Cortec is excited about the new equipment and looks forward to surpassing customer expectations in order delivery.

New Equipment for the Lab

Every year we are getting some additions to our laboratory capabilities. This year wasn't an exception. We are proud to announce that recently we purchased a modern stereomicroscope. It allows us to view materials in 3D. It has been fitted with a camera adapter to allow images to be photographed. Our gas chromatograph (GC-MS) is upgraded with a more powerful computer system to allow for improved data management and faster operation. A personal computer and new instrument software are being purchased to operate our infrared spectrometer (FT-IR). The new software gives us more possibilities with data operation.

We are very proud to say that we are working on the electrochemical equipment, which any company would dream to have.

In addition to the standard electrochemical methods, we are using Rotating Cylinder Electrode (RCE) test for process additives, Impedance spectroscopy for MCI line products and for coatings, and GalvaPulse Instrument for corrosion monitoring of steel reinforcement in the concrete. Recently new software was purchased, which allowed us to use in our experiments one of the most modern electrochemical methods - Electrochemical Noise (EN). Use of this method will open the possibilities for the more precise testing of pitting corrosion, corrosion inside of concrete, evaluating of the process and water-

treatment additives, etc. We also have upgraded the potentiostat - the basic instrument for electrochemical testing, which allowed us to use different software including DC (Direct Current) and AS (Alternate Current)-based.

Cortec's Paint Store Color Matching Equipment

New equipment, and equipment upgrades have been a focus of ours for the last 18 months. Our latest addition is color matching and dispersing equipment that allows us tremendous flexibility with our water-based coating line. Primarily intended for color matching of VpCI-386, the new equipment allows us to match colors using color chips from your customers, or RAL numbers from their current coatings. Installed earlier this summer, it has allowed us to provide samples and orders in a much more efficient manner. Custom colors for VpCI-386 are available in 1 gallon, 5 gallons, and 55 gallons containers. Contact Vanessa Schultz or Cliff Cracauer for pricing information.

**What would you like to see in the next Leading Edge?
We invite you to write to us; we value your input and
are always interested in hearing your suggestions on
how we can be of better service to you.**

LeadingEdge@cortecvci.com



4119 White Bear Parkway, St. Paul, MN 55110 USA
Phone (651) 429-1100, Fax (651) 429-1122
Toll Free (800) 4-CORTEC, E-mail info@cortecvci.com
Internet <http://www.CortecVpCI.com>

