

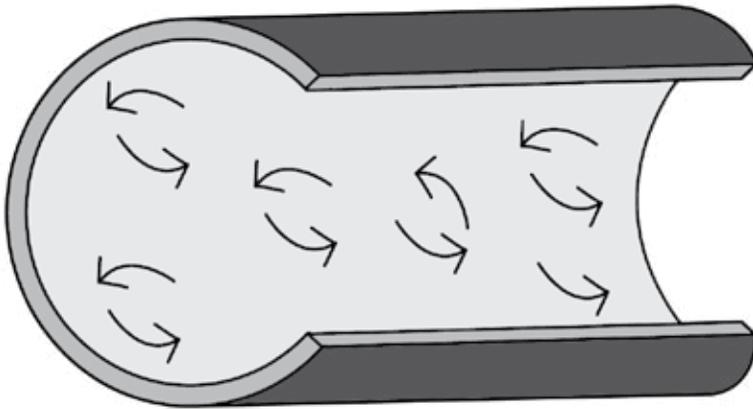


**ECO FLOW™ SYSTEM**  
Reduce Cost & Increase Production

In today's industrial world there is a focus on cost savings and there is a continuous search for new innovative technologies and solutions to extend the working life of existing assets and infrastructure while lowering environmental impact. The world of pipelines is no different in its search for smarter and greener solutions. As a large number of liquid transport pipelines continue to mature and maintenance and operating costs continue to rise, there has been an increased focus on finding environmentally friendly, innovative solutions to achieve these goals.

## Before Treatment

Heavy corrosion, low operating pressure, low throughput.

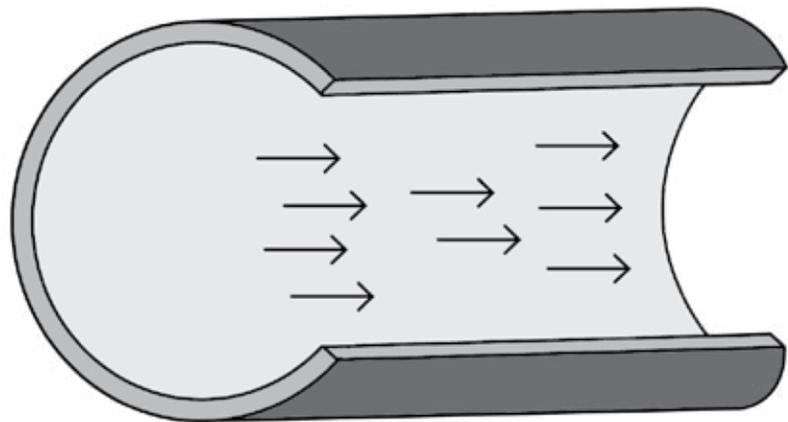


Loss of operating pressure due to corrosion, limited operational flexibility, and pipeline capacity from bottle-necking are some of the issues pipeline owners and operators are facing. Our growing dependence on pipelines for transporting water, oil, gas multi-phase, and other liquids means this infrastructure requires increasing engineering attention. Solutions for these growing issues can have long implementation time and may result in serious capital investment.

## After Treatment

Corrosion stopped, operating pressure maintained, increased throughput.

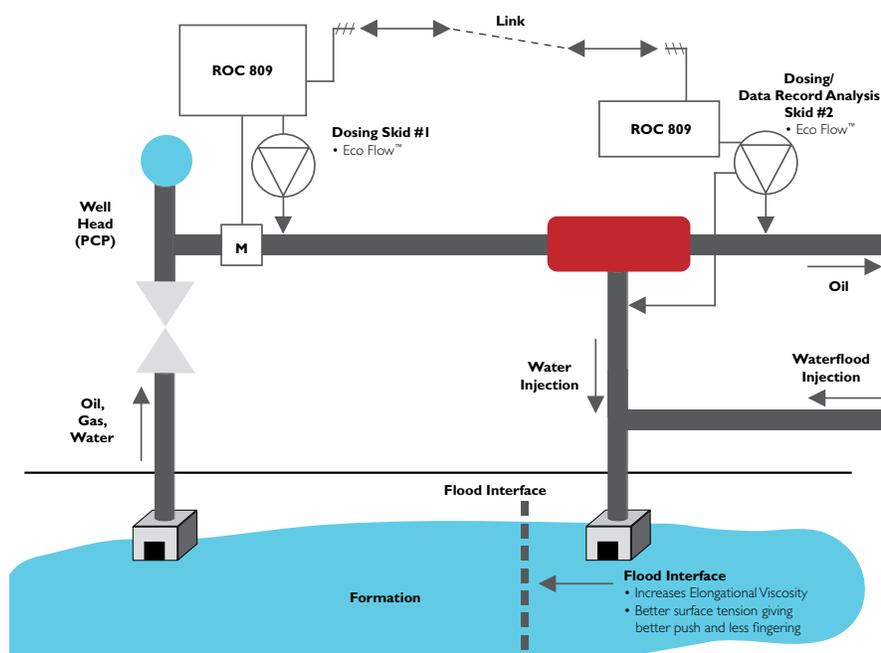
CPS combines a high quality, proven chemical solution with innovative engineering and state-of-the-art equipment designed to provide a solution for the majority of pipeline applications. CPS provides an effective way to manage pressure and/or capacity limitations due to increased water production in existing oil fields and increasing throughput, while reducing scale build up and internal corrosion.



Cortec® has worked to develop the best environmentally friendly solutions for pipeline problems. The CPS™ Eco Flow™ products offer effective and targeted solutions to pipeline bottleneck problems, without the need for mechanical expansion. The Eco Flow™ system is an optimal combination of flow enhancing and corrosion-protecting products allowing increased throughput with the unique effect of Vapor phase Corrosion Inhibiting (VpCI®) protection for pipelines carrying water or a mixture of water and hydrocarbon.

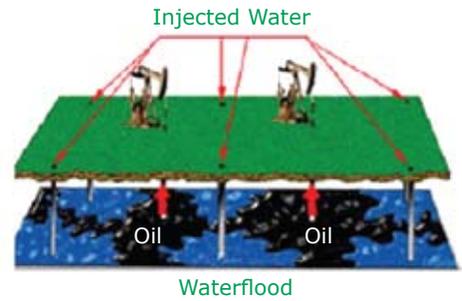
## Enhanced Oil Recovery with Well Head Optimization

As a large number of oil fields both onshore and offshore continue to age, there has been an increasing need for the use of groundbreaking technologies to optimize production and extend the life of existing reservoirs. A common characteristic of aging oil fields is the gradual loss of pressure in the formation as the volume is reduced. A proven method that is being more frequently utilized to increase formation pressure is water injection. The use of flow enhancers to amplify the rate of water injection for both treated water and produced water is also becoming a preferred solution for enhanced oil recovery. However this method does not take into account that age has produced corrosion, compounded by the increase of corrosive producing water re-injection. In time if corrosion is not stopped, this starts to limit operating pressures.



CPS™ provides a scientific economical solution that protects against corrosion and a solution for increased production through water injection. The Eco Flow™ solution is a specific blend of chemical additives controlled and monitored by state-of-the-art injection equipment and application-specific engineering. Once implemented, a substantial increase in water injection rate can be achieved with optimal protection against corrosion and scaling. In addition to increased oil recovery, this system allows the operator to dispose of greater amounts of formation water produced by maturing fields.

CPS™ Eco Flow™ is the total solution for your pipelines. Its benefits can be fully implemented at different locations within the recovery process, increasing throughput, reducing formation back pressure, and eliminating the negative operational effects caused by corrosion. The combination of Eco Flow™ and the correct engineered solution will lead to increased oil production and increased overall recoverable reserves. The reduction of operating pressure will in turn give a lower back pressure at the well head and lead to additional oil production, enabling the operator to realize a substantial annual revenue increase.

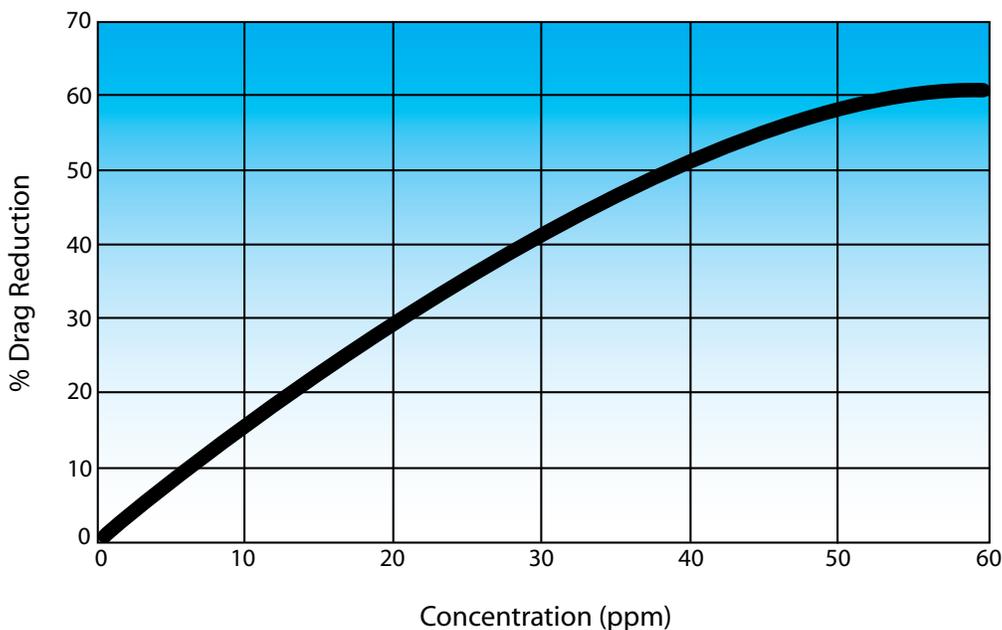


## Cortec® Pipeline Solutions Engineering

CPS™ starts with an evaluation process to determine the specific constraints of the liquid transfer pipeline, water injection system, and/or the crude producing line. Cortec® will identify the optimum solution and the key steps involved in its implementation. In the aforementioned process, data is gathered, systems are analyzed, and calculations made which allows hydraulic modeling work to be carried out, allowing a prediction of what can be achieved by the use of the Eco Flow™ system.

Once this data is obtained and the model is complete, Cortec® can relate this to the true cost savings in pumping requirements, equipment downsizing (reduced Capex), and increased production. At this point, a trial is proposed to prove these predictions.

**Performance Graph of Eco Flow™**



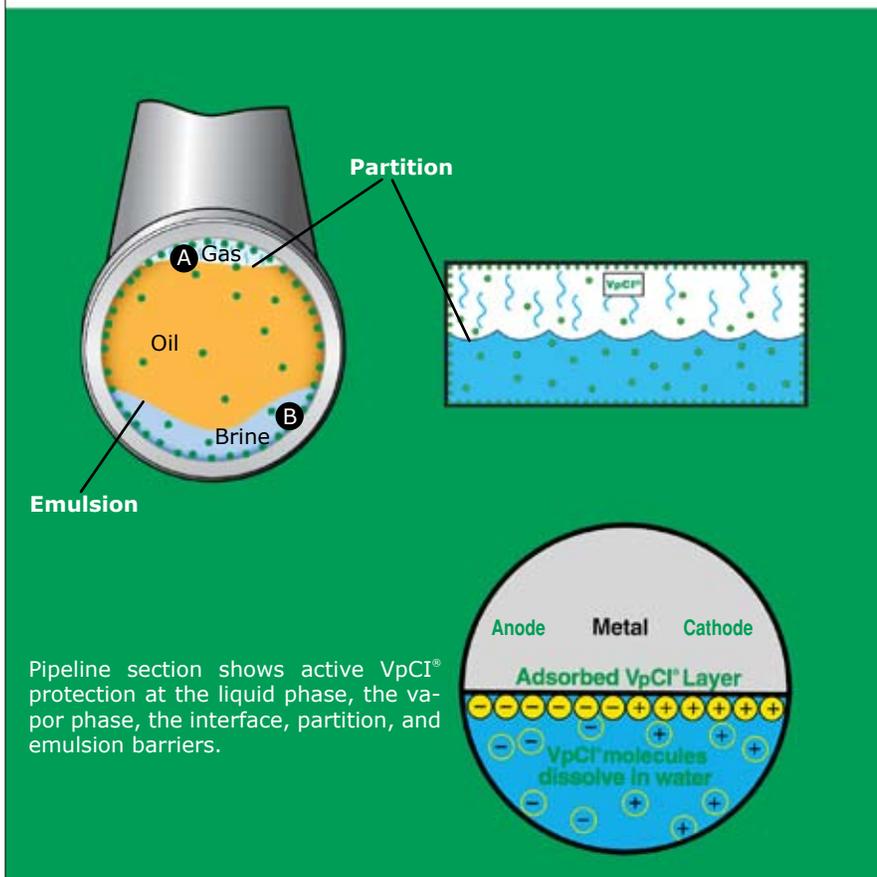
## Eco Flow™ System

The Eco Flow™ system is an optimal combination of flow enhancers and corrosion inhibitors to improve water flow and corrosion protection of pipelines carrying water or a mixture of hydrocarbon and water. The Eco Flow™ combination of chemicals has been designed in such a way that the end user obtains optimal benefit of five prime additives for water treatment, blended in concentrations to obtain maximum performance with a single dosing system.

## Eco Flow™ VpCI®/Anti-Scalant/MIC Inhibitor

The formulation of the Eco Flow™ is a combination of Vapor phase Corrosion Inhibitors, anti scalants, and MIC inhibitors [microbiologically induced corrosion inhibitors-biodispersants] to combat the broadest range of corrosive attack and flow restriction from moisture, condensation, oxygen, carbon dioxide, hydrogen sulfide, and other corrosive contaminants. Unlike conventional methods, such as filming amine corrosion inhibitors, an injection of Eco Flow™ into any part of the system will set the VpCI's to work immediately with a self-replenishing mono molecular protective layer.

### Vapor phase Corrosion Inhibitors (VpCI®)

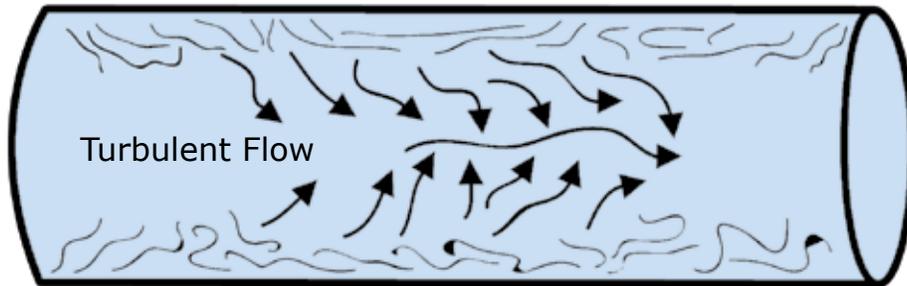


VpCI® technology is a revolutionary environmentally safe and cost-effective option for corrosion protection. VpCI's form a physical bond on the metal surface and create a barrier layer to protect against aggressive ions. The barrier re-heals and self-replenishes, and can be combined with other functional properties for added protective capabilities. It can be used in pipelines, oil and gas wells, refinery units, and fuels.

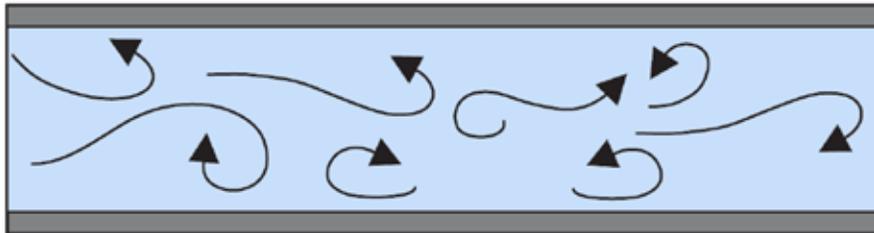
## Eco Flow™ Enhancer

Eco Flow™ Enhancer is also a highly effective polymer for use in water flooding applications. In addition to its flow enhancing characteristics, Eco Flow™ Enhancer increases movement of the residual oil to a producing well by reducing the tendency of water to “finger” or form channels, which bypass much of the residual oil. The high molecular weight makes Eco Flow™ Enhancer more effective at lower concentrations than other water soluble polymers. The lower concentration results in much less formation damage than other polymers. Additionally, the small amount of damage that is inevitable with polymer flooding is completely reversible with Eco Flow™ Enhancer. It has been designed specifically to be effective in pipelines carrying either fresh water, seawater, produced water, or multi-phase systems with a water continuous phase.

Choked Down Pipe

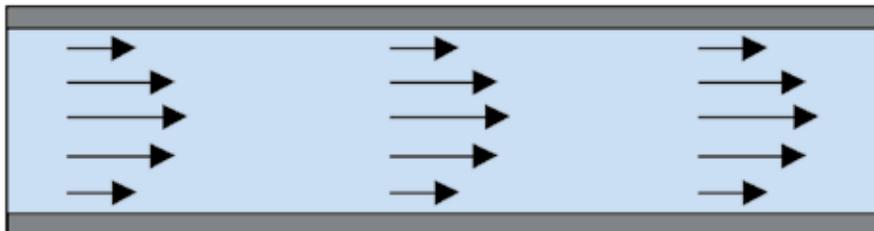


Turbulent (without Eco Flow™)



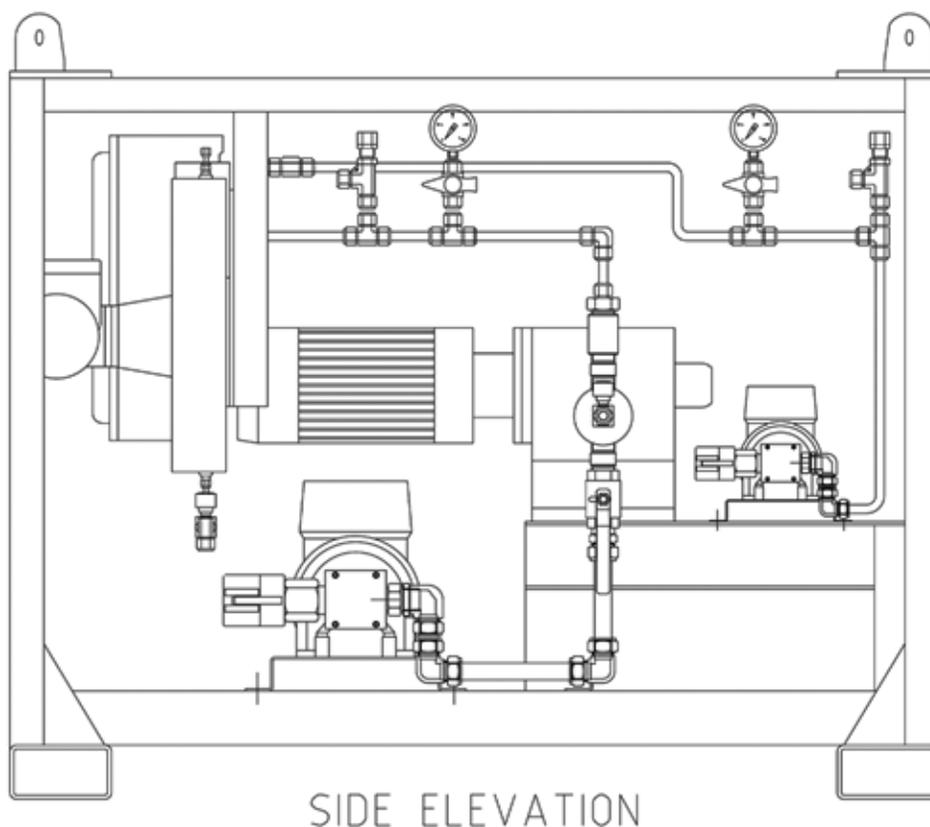
## Eco Flow™ Enhancer

Laminar (with Eco Flow™)



## Eco Flow™ Injection Equipment

Eco Flow™ injection skids are built for each application, designed and configured with installation, functionality, and maintenance considerations in mind. Quality components with proven reliability are used in each package, ensuring that the overall product meets the customer's requirements. The Eco Flow™ injection skids feature a product feed pump and reciprocating plunger positive displacement pump. Pump heads are coupled via reduction gearboxes to suitably rated and certified electric motors.



Flow measurement is achieved by means of a Coriolis mass flow meter, complete with local indication. Capacity control, via a 4-20 mA input, interfaces to an electric servo motor providing "remote" stroke length control to ensure injection rates meet process requirements. Alternately, injection rates to the process are controlled by altering the duty cycle of the drive motor. The skid safety features include pressure safety valves and hi-pressure shutdown switches on each pump. All components, both electrical and mechanical, are certified/rated for the intended location. Prior to shipment, each unit undergoes a rigorous factory acceptance test to ensure that all operational and technical requirements are met. A comprehensive documentation package is also provided. A wide range of options are available for the Eco Flow™ Injection System, providing further flexibility to meet site and operational considerations.

# CPDS<sup>TM</sup>

# ECO FLOW<sup>TM</sup>

Revised: 02/09 Supersedes: 12/07

Cortec®, BioCorr®, BioCortec®, BioCushion™, Boiler Lizard®, Closed Loop Toad®, Cooling Tower Frog®, VpCl®, VpCl® Film Color of Blue®, VpCl-126®, VpCl-609®, VpCl-137®, VmCl-307®, EcoWorks®, EcoAir®, Eco-Corr®, EcoLine®, EcoClean®, EcoShield®, EcoWeave®, EcoSpray®, EcoCoat®, Eco Emitter®, EcoSol®, Eco-Tie®, Eco-Card™, Eco-Shrink™, EcoWrap®, Eco Film®, Cor-Mitt®, Cor-Pak®, CorShield®, CorSol®, Corrosorbers®, CorWipe®, Cor/Verte®, Corr Seal®, CorrLam®, Corr-Fill®, Corrtube®, CRI®, Desicorr®, Electricorr®, GalvaCorr®, Super Corr®, HPRS®, CRI®, MCI®, MCI Grenade®, Milcorr®, Nano VpCl®, and Rust Hunter® are trademarks of Cortec® Corporation.  
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