Coating Catalog

www.SILVER-FOX.net

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PREFACE

Silver Fox Completion Services is proud to offer industry leading advanced protective coatings designed for adverse conditions. It is our goal to help educate and inform our customers of the benefits and solutions that our coatings offer.

Coatings are found almost everywhere in daily life. Two of the most prominent coatings are architectural wall coatings and automotive paints. These coatings are applied to give a decorative appearance and to form a protective barrier around the object they are applied to. In general coatings are applied in order to give a desired appearance such as gloss or colour or to provide functional properties to a product. Some properties that can be provided by coatings include a harder surface that resists sliding wear, protection from rust and chemical attack and improved lubrication that allows solutions to flow by more easily. A properly applied coating in the right application can exponentially extend the life of the product, which in turn provides valuable ROI.

We are pleased to provide this information as a guide to finding the right direction. This is not an instruction manual but a brief introduction to the world of coatings. Part of our business and what sets us apart is helping you understand and choose the correct coating for your application. Prior to finalizing your decision for a coating it is important to contact one of our coating consultants. These highly trained individuals specialize in helping you reach an informed decision about coatings for your application.

"Protect Your Investment"

Deterioration caused by erosion, corrosion, oxidation, chemical attack and other factors is an unavoidable natural phenomenon. The effects of deterioration can be observed every day, everywhere in the world. Silver Fox Completion Services helps by offering solutions that increase the longevity of your product by reducing the need to replace parts between jobs, decreasing down-time and labour associated with failed parts, all of which lower your operating costs.

Since opening our coatings service in 2008, Silver Fox has applied our advanced protective coatings to tens of thousands of parts. We pride ourselves on the quality and fast turn-around we provide to our customer. Our advanced coatings have seen use all over western Canada in many applications from cryogenics to food processing, pipelines, oil and gas tools, heavy oil applications and refineries.

Silver Fox Completion Services exists to protect your investment with the right coating for the job. Do not hesitate to contact us for help with your coating needs. Our goal is to protect your investment. We hope this catalogue will help you find solutions that earn you an excellent ROI and substantially increase the performance of your product.

FAILURE MODES

A failure mode can be described as when an component or product fails to perform to its intended standard. This failure can be caused by a multitude of factors, few of which are reversible, some are preventable and others are based on managing the time to failure.

For our intended purpose we will focus on the following failure modes:

Corrosion (H_2S, CO_2, Acids, Brines)
Deposition (Asphaltenes, Scale, Parrafin)
Wear (Abrasive, Corrosive and Erosive)

All three types damage or deteriorate product to an unusable state. Each method is unique and our goal is to provide some insight into what coatings can be used to help mitigate each of them.

Corrosion

Corrosion can be defined as the deterioration of a substance or its properties because of a reaction with its environment. The substance we will consider is steel. Steel is an iron compound with alloying elements such as carbon and manganese. Corrosion occurs in normal environments with virtually all materials except those termed noble, i.e., gold, platinum, etc. The most common form of corrosion is oxidation. Most metals react with the oxygen in air or water to form oxides. Elevated temperatures greatly increase the rate of all chemical reactions.

Silver Fox's Nap-Gard® , TefCote™ and NickelCote™ protective coatings are commonly applied to successfully mitigate corrosion.

Deposition

Deposition is one of the most serious problems, which usually occurs in oil wells, petroleum production, oil processing, and transportation facilities. Deposition of heavy organic components such as asphaltenes, scale and paraffin can lead to well-bore blockage and impacts well economics due to reduction in oil production.

Silver Fox's TefCote™ protective coating is the ideal choice for preventing deposition.

Wear

Wear as defined in Oxford Dictionary is the damage or deterioration sustained from continuous use. Failure by "wearing out" is generally a gradual process and is sometimes repairable. Ultimately, any system that does not fall victim to one of the other two modes of failure will inevitably wear out if kept in service long enough. Wear is the final mode of failure, that nothing escapes. Thus, we should realize that we cannot design to avoid all types of wear completely, only to postpone them.

Silver Fox's BorCote™, NickelCote™ and NapGard® protective coatings are commonly applied to successfully minimize the effects of wear.

CORROSION

Historically, the first recorded incidence of corrosion was a problem encountered by British ships operating in the Mediterranean early in the nineteenth century. Worms living in those waters would enter the wooden hulls and eat the timbers until ships required dry-docking for replacement of these wooden structures. The British decided to cover the ship gulls with thin sheets of copper and the worm problem was solved, or so it appeared. Soon the copper sheets began falling off the hulls and the worm problem returned. The steel nails holding the copper had disintegrated where the copper and steel were in contact and no one could explain the reason. We now know that a galvanic action occurs between dissimilar metals in sea water. Using copper nails resolved this problem.

Examples of Corrosion:

- Electrochemical
- Chemical
- Oxidation
- Galvanic
- Corrosion-erosion

Chemical

Chemical corrosion can be attributed to elements such as H_2S, CO_2, Acids and Brine. Oilfield corrosion can be grouped into "Sweet" corrosion (simple metal dissolution followed by pitting) and "Sour" corrosion (H_2S - results in the formation of various insoluble iron sulfides on the metal surface). Corrosion due to oxygen, is found with surface equipment and can be found downhole with the oxygen introduced by waterflooding, pressure maintenance, gas lifting or completion and/or workover fluids. It is the major corrodant of offshore platforms at and below the tide line.

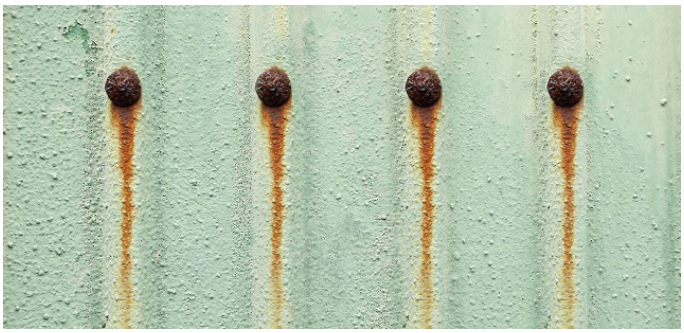
Oxidation

One of the most obvious examples is a steel object left exposed to weather. It will begin to rust and, if left undisturbed, will completely deteriorate. Rust is a combination of iron and oxygen, in which the iron gives up its energy and returns to its natural state. In most instances more than one type of corrosion contributes to a failure. Corrosion of metal by oxidation is the ordinary rust observed on any unprotected piece of steel. It can only occur in the presence of water, and then only if dissolved oxygen is present. However, it will also occur in sea water and salt solutions.

CORROSION

Galvanic

Dissimilar metals and alloys have different electrode potentials, and when two or more come into contact in an electrolyte, one metal acts as anode and the other as cathode. The electropotential difference between the dissimilar metals is the driving force for an accelerated attack on the anode member of the galvanic couple. The anode metal dissolves into the electrolyte, and deposit collects on the cathodic metal.

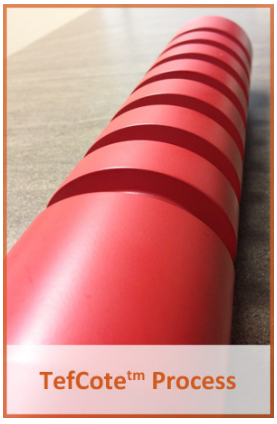


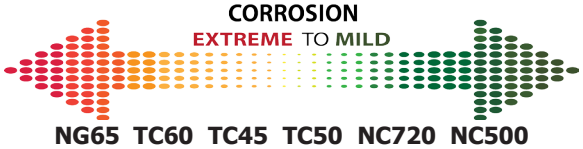
How to Prevent or Delay Corrosion

Based on factors that apply to the exposure of your parts will help determine the best course of action for prevention methods.

Consider factors such as:

- PH
- Temperature
- Chemical/Acid exposure
- Contaminated Water
- H2S, C02





Rated from superior to very good corrosion resistance

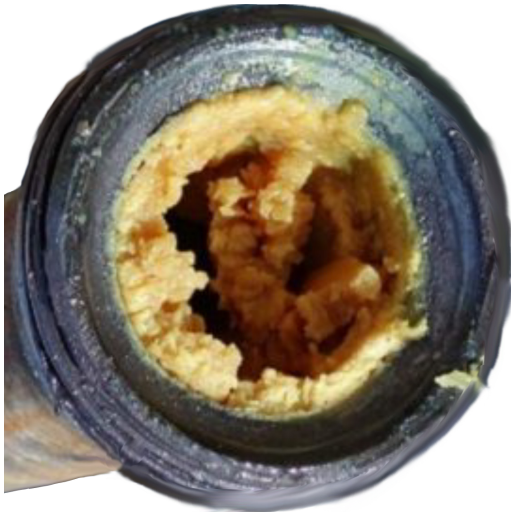
DEPOSITION

Asphaltenes

Asphaltenes are molecular substances that are found in crude oil, along with resins, aromatic hydrocarbons, and saturates (i.e. saturated hydrocarbons such as alkanes). The word "asphaltene" was coined by Boussingault in 1837 when he noticed that the distillation residue of some bitumens had asphalt-like properties.

In the oil field, asphaltenes are best known for clogging wells, flowlines, surface facilities and subsurface formations. Laboratory analysis and field intervention help producers avoid or remediate asphaltene deposition. New science is finding ways to use these enigmatic hydrocarbon compounds to better understand reservoir architecture.

Certain types of polymeric coating materials have shown, through laboratory evaluation, to possess the necessary surface characteristics for the mitigation of asphaltene deposition regardless of its precipitation. The application of a polymer based coating system, with a sufficient chemically inert surface, has also shown the ability to prevent the not just the deposition but also the tenacious adherence of asphaltene deposits in field applications.



Paraffin

As temperatures decrease in your production system, there is the potential for higher carbon chain paraffins to precipitate out of solution, forming deposits on the surfaces of your pipe and equipment. As this occurs, you may experience a number of production problems, such as blocked pore spaces and perforations, plugged tubing, downhole pump failures, or blocked valves – all leading up to the possible loss of oil and gas production.

DEPOSITION

Scale

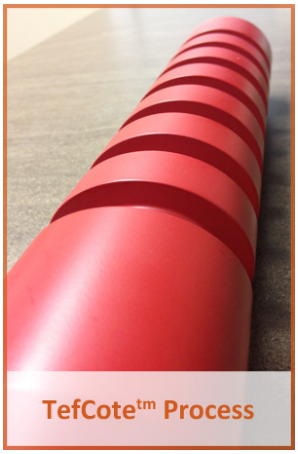
Based on the changes in pressures, pH, temperatures and the amount of dissolved solids in your produced water, there is an inherent risk of mineral deposits forming on the surfaces of your entire production system. For example, some minerals are soluble in reservoir conditions downhole, as they are brought to the surface, they can begin to produce scale, such as calcium carbonite, calcium sulfate and barium sulfate, potentially increasing your operating expenses, decreasing or stopping the flow of fluids and causing premature equipment failure and fouling.

How to Prevent or Delay Deposition

Based on factors that apply to the exposure of your parts will help determine the best course of action for prevention methods.

Consider factors such as:

- PH
- Temperature
- Chemical/Acid exposure
- Contaminated Water
- Scale, Asphaltenes



Rated from superior to very good High Release properties

WEAR

Wear is a broad term that encompasses many types of failures, all of which involve changes to the surface of the part. Some of these so-called wear mechanisms are still not completely understood, and rival theories exist in some cases. For our intended purpose, we are going to focus on three types of wear that are common in our focal industry and world-wide (Abrasive, Corrosive and Erosive wear).

Abrasive Wear

Abrasive wear occurs when a rough, hard surface glides across a surface that is relatively softer. Abrasive wear is typically categorized by the contact environment and the type of contact. The contact type defines the abrasive wear mode.

There are several factors that influence the occurrence of abrasive wear and the way a material is removed. The particles that cause abrasion are often called contaminants. Contaminants are anything that enters a system that creates abrasion.

Two common types of Abrasion:

Two-body abrasive wear

- This type takes place when hard particles or grit eliminate material from the opposing surface. This can be best described by thinking of a material being displaced or removed through a plowing or cutting operation. An example of is using a file to shape a work-piece.

Three-body wear

- This occurs when the particles are unconstrained and are able to slide down and roll on a surface, where particles between the two surfaces remove material from one or both surfaces. The tumbling process is an example of this.

Corrosive Wear

Corrosive wear is material degradation wherein both wear and corrosion wear mechanisms are present. The effects of both wear and corrosion can result in intense damage or material losses. The effects can be more severe than when encountering either of these two mechanisms alone. Typically, surface failure such as erosion and abrasion results from the dynamic interaction between two surfaces. It is the kind of damage resulting from the synergistic attack of both wear and corrosion when it takes place within a corrosive setting.

Having a clear understanding of the causes and nature of corrosive wear is important in choosing and using components or parts.

Corrosive wear is the result of acids and chemicals that are commonly produced in plastic processing, since these substances attack screws' and barrels' surfaces. The main characteristic of corrosive wear is pitting, which typically takes place in the last flights of the metering and transition zone. These pits could also lead to:

- Melting
- Degradation
- Burning

All of these may result in burned or blackened particles in various parts.

One of the major causes of corrosive wear is inappropriate component materials. For best practices, it is always recommended to make use of materials with excellent corrosion resistance properties. For instance, materials that work perfectly with screws and barrel linings include nickel alloys, hardened stainless steel as well as iron-free materials. Other factors that lead to corrosion wear include:

- Improper design
- Inappropriate heat profile
- Insufficient moisture removal

Erosive Wear

Erosive wear can be defined as an extremely short sliding motion and is executed within a short time interval. Erosive wear is caused by the impact of particles of solid or liquid against the surface of an object. The impacting particles gradually remove material from the surface through repeated deformations and cutting actions. It is a widely encountered mechanism in industry. Due to the nature of the conveying process, piping systems are prone to wear when abrasive particles have to be transported.

The rate of erosive wear is dependent upon a number of factors. The material characteristics of the particles, such as their shape, hardness, impact velocity and impingement angle are primary factors along with the properties of the surface being eroded. The impingement angle is one of the most important factors and is widely recognized. For ductile materials the maximum wear rate is found when the impingement angle is approximately 30°, whilst for non-ductile materials the maximum wear rate occurs when the impingement angle is normal to the surface.

Mating Surfaces

When two surfaces are pressed together under load, their apparent area of contact is easily calculated from geometry, but their real area of contact is affected by the asperities present on their surfaces and is more difficult to accurately determine. The tops of the asperities will initially contact the mating part and the initial area of contact will be extremely small. The resulting stresses in the asperities will be very high and can easily exceed the compressive yield strength of the material. As the mating force is increased, the asperity tips will yield and spread until their combined area is sufficient to reduce the average stress to a sustainable level, i.e., some compressive penetration strength of the weaker material.

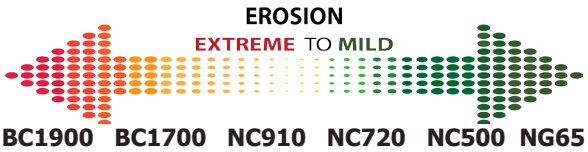
We can get a measure of a material's compressive penetration strength from conventional hardness tests (Brinell, Rockwell, etc.), that force a very smooth stylus into the material and deform (yield) the material to the stylus' shape.

How to Prevent or Delay Wear

Based on factors that apply to the exposure of your parts will help determine the best course of action for prevention methods.

Consider factors such as:

- High H2S, CO2 wells
- Pumps (ESP, Centrifugal)
- Sand Control
- High flow areas
- SAGD components



Rated from superior to good erosion resistance

FINAL CONSIDERATIONS

IMPORTANT

We advise that you consider a few things before you make a final decision on your coating.

1. Tolerance

Some tools and equipment have a tight tolerance, very fine threads or other factors that may affect its performance once coated. Prior to coating, you should consult with your engineering department on how the coating thickness and process might affect the performance of the tool. There may be steps you can perform prior to coating, such as opening an ID, shaving down an OD, oversize tapping your threads etc. Sometimes, just a simple 'test run' will do.

2. Material Type

The type of material will determine whether or not a particular coating will be appropriate for your product. Due to the process involved in coating, plating and diffusing, the type of material is crucial information prior to applying a protective coating to ensure success. Types of materials range greatly for steel, so it is important to have this information prior to considering a specific coating.

3. Assembly

Assemblies must be completely broken down into parts prior to coating and be in good condition to ensure optimal coating quality.

4. Cost

If you have a budget, there may be different options available that will yield similar results. This is where it would be beneficial to speak with one of Silver Fox's experienced personnel to determine the best option.

5. Choosing the Right Supplier

It is important to choose a supplier that follows a Quality Management System such as ISO:2008 or similar when selecting a company to apply your coating. This will ensure that strict operating procedures are followed, documented and certified; ensuring you receive the correct product, applied at the specification you require.

CERTIFICATE OF REGISTRATION

This is to certify that

Silver Fox Completion Services Inc
229 Clearview Drive, Red Deer County, Alberta T4E 0A1 Canada

operates a

Quality Management System

which complies with the requirements of

ISO 9001:2008

for the following scope of registration

Application of advanced protective coatings, and sale of wholesale downhole tools.

Certificate No.: CERT-0073613
File No.: 1646228
Issue Date: May 19, 2015

Original Certification Date: May 19, 2015
Current Certification Date: May 19, 2015
Certificate Expiry Date: May 18, 2018

Chris Jouppi
President,
QMI-SAI Canada Limited

Samer Chaouk
Head of Policy, Risk and Certification

ISO 9001

SAI GLOBAL

These charts are intended as a reference guide.
We suggest using them as a starting point only.

DEPOSITION

	TefCote™			Nap-Gard®
	TC45	TC50	TC60	NG65
Thickness (mils)	0.8 to 1.2	0.8 to 1.2	2 to 3	10 to 22
Non-Stick (lubricant)	**EXCELLENT**	**SUPERIOR**	**EXCELLENT**	**VERY GOOD**

CORROSION

	TefCote™			Nap-Gard®	NickelCote™	
	TC45	TC50	TC60	NG65	NC500	NC720
Thickness (mils)	0.8 to 1.2	0.8 to 1.2	2 to 3	10 to 22	0.8 to 1.2	0.8 to 1.2
Corrosion Resistance	**SUPERIOR**	**EXCELLENT**	**SUPERIOR**	**SUPERIOR**	**VERY GOOD**	**EXCELLENT**

WEAR

	Nap-Gard®	NickelCote™			BorCote™	
	NG65	NC500	NC720	NC910	BC1700	BC1900
Thickness (mils)	10 to 22	0.8 to 1.2	0.8 to 1.2	0.8 to 1.2	0.5 to 6	0.5 to 8
Abrasive Wear	**FAIR**	**GOOD**	**GOOD**	**VERY GOOD**	**EXCELLENT**	**SUPERIOR**
Corrosive Wear	**GOOD**	**VERY GOOD**	**EXCELLENT**	**FAIR**	**GOOD**	**GOOD**
Erosive Wear	**FAIR**	**GOOD**	**GOOD**	**VERY GOOD**	**EXCELLENT**	**SUPERIOR**

TefCote™

TefCote™ is a dry film coating that imparts superior corrosion resistance to the base material of the material being coated. TefCote™ has superior corrosion and chemical resistance, provides protection from severe corrosion attack such as C02, H2S and Chlorides. It provides deposition protection against scale and asphaltenes and performs extremely well in high working temperatures. This coating is an excellent choice for application requiring a thickness above 0.001' (25um) and provides a uniform thin-film coating, improved lubrication for threads, sealing areas, etc.

TefCote™ has been successfully applied to the wetted parts of a wide variety of oilfield components, which are subjected to severely corrosive environments.

Applications:

- High H_2S, CO_2 wells
- Contaminated Water Wells
- Downhole Tool Components
- Landing Nipples, Slick Joints
- Ball & Gate Valves

TefCote™ Capabilities:

- Up to 6' Tall x 6' Wide x 24' Long
- Max weight 2000 lbs

Features:

- Superior Corrosion Resistance (H_2S, CO_2, Chlorides)
- Deposition Protection (Scale, Asphaltenes)
- Improved Lubrication (Threads, Sealing Areas)
- Uniform Thin-Film coating
- Beyond Line of sight coverage possible
- Masking is possible

TefCote™ has three distinct versions:

TC45 (FEP)

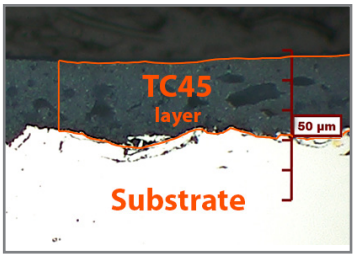
TC50 (PTFE)

TC60 (PFA)

TefCote™

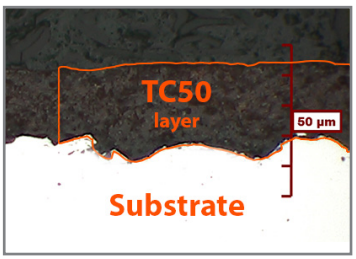
TC45 (FEP)

is a thin-film protective coating that typically comes in light blue colour. It has excellent corrosion protection since it bonds as one continuous film. It has a very smooth surface that provides low friction.



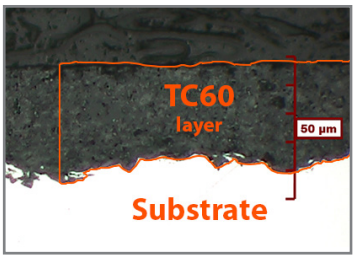
TC50 (PTFE)

is a thin-film protective coating that typically comes in red or black colour. It has a very high working temperature and is very resistant to deposition particulates (scale, asphaltenes), as well as provides excellent lubrication to threads.



TC60 (PFA)

is a medium thick dry film protective coating that typically comes in black colour. It has excellent corrosion protection as it bonds as one continuous film. It can withstand high working temperatures and it exhibits greater toughness than PTFE or FEP.



PROPERTY	ASTM	UNIT	TefCote™		
Trade Name			TC45	TC50	TC60
Chemical Name	-	-	FEP	PTFE	PFA
TYPICAL THICKNESS & PROFILE					
Thickness Range - **Mils** (Microns)	-	-	**0.8-1.2** (20 - 30)	**0.8-1.2** (20 - 30)	**1.5 - 5.0** (38 - 127)
Coating Cure Profile	-	-	Smooth (non-porous)	Smooth (Slightly Porous)	Smooth (non-porous)
TEMPERATURE					
Max Working Duty Temp **˚F** (˚C)	-	-	**400** (205)	**550** (290)	**500** (260)
Max Intermittent Temp **˚F** (˚C)	-	-	**450** (230)	**600** (315)	**550** (290)
Melting Point Temp **˚F** (˚C)	-	-	**500** (260)	**621** (327)	**582** (305)
PHYSICAL PROPERTIES					
Non-Stick	**none**		**Excellent**	**Superior**	**Excellent**
Mold-Release	**none**		**Excellent**	**Superior**	**Excellent**
Chemical Resistance	**none**		**Superior**	**Excellent**	**Superior**
MECHANICAL PROPERTIES					
Hardness	**D2240**	**Shore D**	**50**	**55 - 65**	**60**
Specific Gravity	**D792**	-	**2.15**	**2.15**	**2.15**
Coefficient of Friction	**D1894**	**Static**	**.12 - .20**	**.12 - .15**	**0.2**
		Dynamic	**.08 - .30**	**.05 - .10**	-
Water Absorption	**D570**	**%**	**<.01**	**<.01**	**<.03**
Contact Angle	-	**Water ˚**	**95 - 105**	**104 - 111**	**104 - 111**
Weather Resistance	**Florida Exp.**	**Yrs Unaffected**	**20**	**20**	**10**

Nap-Gard®

Nap-Gard® (NG65) Internal Pipe Coating is a thermosetting epoxy powder generally recommended for use on the inside of steel pipe which is in adverse temperature and pressure service and in contact with corrosive oils, gases, and waters.

Applications:

- High CO_2, H_2S wells
- Contaminated Water Wells
- ID of Pipelines, Gas Fittings, Well Hookups

Features:

- Superior Corrosion Resistance (see chart)
- Uniform Thick Build Coating
- Beyond Line of sight coverage possible
- Masking is possible

Nap-Gard system has been tested for a period of two years in ambient temperature in the chemicals listed below with no effects.

Acids:

- Acetic 25%
- Boric
- Citric 25%
- Formic 10%
- Hydrochloric 15%
- Hydrofluoric 40%
- Muriatic
- Nitric 25%
- Oxalic
- Phosphoric 50%
- Sulfuric 50%

Organic Liquids:

- Crude Oil*
- Diesel Fuel
- Diethylene Glycol
- Ethylene Glycol
- Gasoline
- Avgas
- Glycerine
- Heptane
- Hexane
- Kerosene
- Water (Salt)*

Inorganic Compounds:

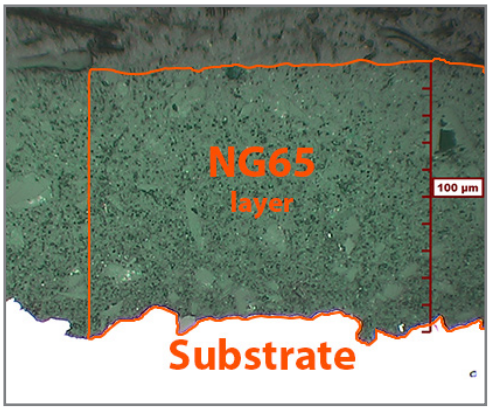
- Aluminum Chloride
- Calcium Sulfate
- Caustic Potash
- Ferric Sulfate
- Potassium Nitrate
- Magnesium Hydroxide
- Mercuric Chloride
- Sodium Chloride
- Sodium Sulfate
- Sulphur
- Zinc Sulfate

*also tested at 4,000psi and 121° C in crude oil and salt water mixtures simulating crude oil production conditions found in wells of moderate depth

Nap-Gard®

NG65

is a thermosetting epoxy powder designed as a coating for both external and internal buried pipeline service. In particular, it is recommended for use on the inside of steel pipe which is in adverse temperature and pressure service and in contact with corrosive oils, gasses and waters.



NG65 meets the requirements of AWWA standards C116, C213, C550 and CSA standard Z245.20-10 and has been certified to ANSI/NSF standard 61, drinking water system components.

PROPERTY	ASTM	UNIT	NapGard
Trade Name			NG65
Chemical Name	-	-	7-0014
TYPICAL THICKNESS & PROFILE			
Thickness Range - **Mils** (Microns)	-	-	**10 - 15**
Coating Cure Profile	-	-	Smooth
TEMPERATURE			
Heat Distortion Resistance ˚**F** (˚C)	-	-	**229˚F (109˚C)**
PHYSICAL PROPERTIES			
Non-Stick (lubricant)			**Very Good**
Abrasion Resistance			**Fair**
Erosion Resistance			**Fair**
Corrosion Resistance			**Superior**
MECHANICAL PROPERTIES			
Plastic Hardness HRR			**60**
Taber abrasion	**D4060**	**1000 cycles**	**40mg weight loss**
Shear Adhesion	**D1002**		**4677 PSI**
Impact Resistance	**G-14**	**1/4 x 4 x 4 @ 25C**	**5016/in Pass**

NickelCote™

NickelCote™ is an Electroless Nickel barrier coating, in which it protects the substrate (eg. steel) by sealing it off from the environment. NickelCote™ imparts superior corrosion resistance and added wear resistance to the base material being coated.

This coating exhibits excellent mechanical strength and phenomenal adhesion from mechanical and chemical bonding. This is an excellent coating for applications requiring a thickness above 0.001" and displays excellent deposit uniformity which is evident in the recesses of the substrate (eg: Threads). NickelCote™ is used on equipment by many Oil and Gas companies which have shown to increase the corrosion resistance significantly.

Applications:

- High Flow Areas
- High H_2S, CO_2 wells
- Pumps (ESP, Centrifugal)
- Downhole Completion Equipment
- SAGD Components

NC720

NickelCote™ Capabilities:

- Tank Dimensions 2' H x 2' W x 6' L
- Trough Dimensions 8" OD x 30' L
- Weight limit 2000 lbs max

Features:

- Abrasion, Corrosion, Erosion Protection
- Uniform coating
- Beyond line-of-sight coverage possible
- Impact resistant
- Masking is possible

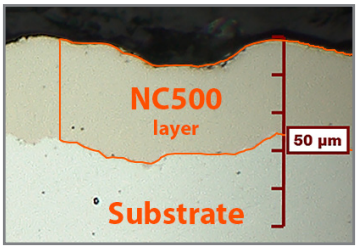
NC500

NickelCote™ has three distinct versions:

- NC500 (As Plated)
- NC720 (Diffused)
- NC910 (Heat Treated)

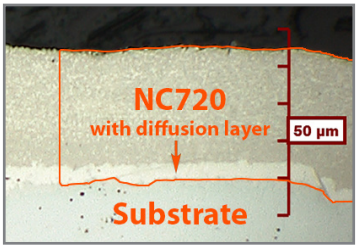
NickelCote™

NC500 (As Plated)



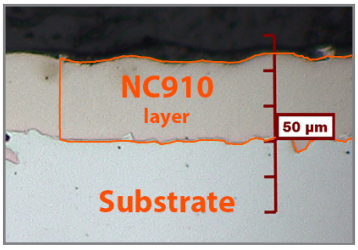
is the "as-plated" version. In this condition the coating is amorphous and free of porosity, and non-magnetic. NC500 can provide a more effective and more economic protection than any other coating in most environments.

NC720 (Diffused)



is our specific "Diffused" version. Due to the nano nickel layer that is diffused to the substrate, this condition is highly corrosion resistant, as such the diffused layer will not flake or peel. As well the hardness of the layer is increased giving it a better Taber Wear Index than NC500.

NC910 (Heat Treated)



is our specific "Heat-Treated" version. This layer has been heat treated to greatly improve the wear resistance properties. In this condition however the corrosion properties have been reduced. As well the bond strength to substrate is increased in this condition.

PROPERTY	ASTM	NickelCote™		
Trade Name		NC500	NC720	NC910
Chemical Name	-	ENC-HP	ENC-HP	ENC-HP
TYPICAL THICKNESS & PROFILE				
Standard Thickness - **Mils** (Microns)	-	**1.2** (30)	**1.2** (30)	**1.2** (30)
Coating Profile	-	As Plated	Diffused	Heat Treated
TEMPERATURE				
Max Working Duty Temp **˚F** (˚C)	-	**500** (260)	**1382** (750)	**932** (500)
Melting Point Temp **˚F** (˚C)	-	**1652** (900)	**1652** (900)	**1652** (900)
PHYSICAL PROPERTIES				
Non-Stick		**Very Good**	**Very Good**	**Very Good**
Abrasion Resistance		**Good**	**Good**	**Very Good**
Erosion Resistance		**Good**	**Good**	**Very Good**
Corrosion Resistance		**Very Good**	**Excellent**	**Fair**
MECHANICAL PROPERTIES				
Rockwell C Hardness	**ASTM E18**	**48 - 50**	**58 - 62**	**64 - 67**
Phosphorous Content		**10.5 - 11.5**	**10.5 - 11.5**	**10.5 - 11.5**
Physical Appearance		**Semi-Bright**	**Gaseous**	**Semi-Bright / Purple Gaseous**
Taber Wear Resistance	**CS-10, 1kg load**	**22 - 24 mg/1000cycles**	**9 - 12 mg/1000cycles**	**9 - 12 mg/1000cycles**
Intrinsic Stress		**Compressive**	**Compressive**	**Compressive**
Magnetic Properties		**Non-Magnetic**	**Non-Magnetic**	**Non-Magnetic**
Porosity		**Low - Very good salt spray performance**		

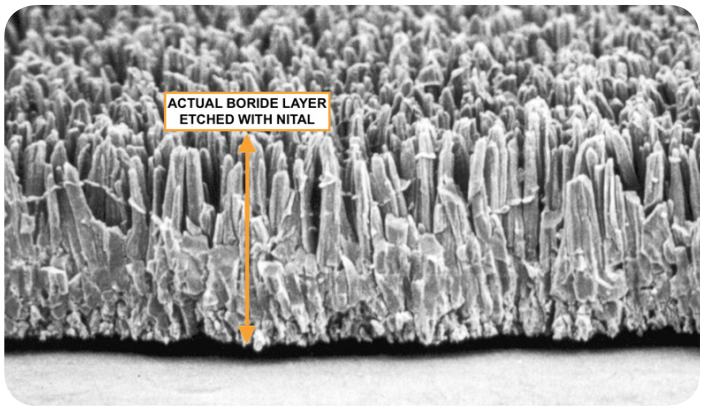
BorCote™

BorCote™ is our proprietary boronizing process that utilizes a proven patented chemical that transforms the surface structure of steel into one that resists abrasion, corrosion and erosion.

The new BorCote™ surface layer itself is extremely hard, commonly exceeding 80+ or higher Rockwell 'C' hardness, and yet this BorCote™ layer will not flake or peel, and is impact resistant. This process can be applied on complex parts with unorthodox geometries or areas beyond line of sight, and it will maintain uniform growth. Silver Fox offers two version of this process: BC1700 and BC1900.

Applications:

- High Flow Areas
- Sand Control
- Pumps (ESP, Centrifugal)
- Frac Components
- SAGD Components



BorCote™ Capabilities:

- Parts up to 6' Long
- Max Weight 1000 lbs

Features:

- Abrasion, Corrosion, Erosion Protection
- High Hardness (typically 75 HRc or higher)
- Uniform Diffusion coating
- Beyond Line of sight coverage possible
- Impact resistant
- Masking is possible

BorCote™ has two distinct versions:

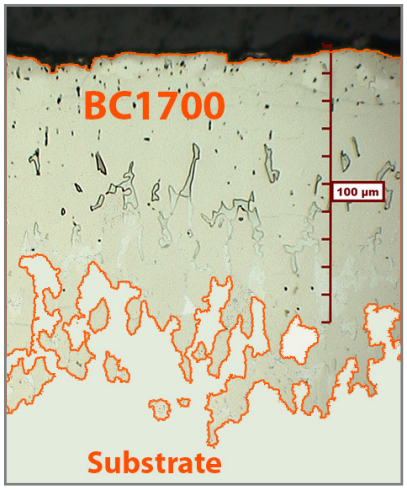
- BC1700 (Standard Powder Blend)
- BC1900 (Premium Powder Blend)

BC1900 (Premium Blend)

is our premium powder blend that offers extreme abrasion and erosion protection where required.

BC1700 (Standard Blend)

is our standard powder blend. This version should be considered for moderate to high abrasion and erosion protection where required.



PROPERTY		ASTM	BorCote™	
Trade Name			BC1700	BC1900
Chemical Name		-	Boronized	Boronized
TEMPERATURE				
Max Working Duty Temp **˚F** (˚C)		-	**842** (450)	**842** (450)
Melting Point Temp **˚F** (˚C)		-	**1202** (650)	**1202** (650)
PHYSICAL PROPERTIES				
Non-Stick			**Fair**	**Fair**
Abrasion Resistance			**Excellent**	**Superior**
Erosion Resistance			**Excellent**	**Superior**
Corrosion Resistance			**Good**	**Good**
TYPICAL THICKNESS & PROFILE				
Coating Cure Profile		-	Diffused	Diffused
Thickness Range - **Mils** (Microns)	Carbon/Alloy/Tool Steel	-	**2 - 5** (50 - 125)	**3 - 8** (75 - 200)
	Stainless Steel	-	**0.5 - 2** (13 - 50)	**0.5 - 3** (13 - 75)
	Cast Steel	-	**1 - 2** (25 - 50)	**1 - 3** (25 - 75)
MECHANICAL PROPERTIES				
Knoop Hardness (Approx HRc)	Carbon/Alloy/Tool Steel	ASTM E18	**1700HK** (78Rc)	**1900HK** (80Rc)
	Stainless Steel		**1550HK** (76Rc)	**1700HK** (78Rc)
	Cast Steel		**1450HK** (75Rc)	**1600HK** (77Rc)

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