DrilTec® PRODUCT RANGE

Wear Resistant Technology for Advanced Drilling

Hardfacing Materials and Processes

Castolin Eutectic®
Eutectic Castolin

Castolin Eutectic milestones and the evolution of the OilTec Programme

1906 Foundation of Castolin Eutectic in Lausanne, Switzerland. Patented, low-temperature metal alloy for repair.

1940 Foundation of Eutectic Welding Alloys Corporation in New York.

1963 Launch of Eutalloy® torch for powder spraying with simultaneous fusion. More than 42,000 units sold.

1965 Powder production by water atomisation.

1969 Launch of EuTronic Gap® equipment for powder Plasma Transferred Arc (PTA) welding.

1971 Launch of RotoTec® I torch for powder cold-spraying. More than 17,000 units sold.

1976 Powder production by gas atomisation.

1985 Launch of the world's first amorphous powder for thermal spraying.

1995 Acquisition of TAFA Thermal Spray and leading HVOF technology.

1998 Creation of Global OilTec team.

2007 Acquisition of Trio OilTec Services in Stavanger, Norway.

2012 Purchase of largest diode laser cladding system in Scandinavia, dedicated to oil production.

2012 Development of fully automated PTA cladding system for stabilizers.

2013 Acquisition of Monitor Coatings (UK) and mud-rotor protection technology.

1083

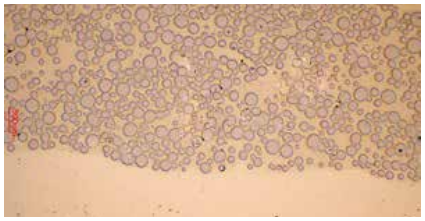
Contents

DrilTec® STC Coating systems

Castolin Eutectic has invested in Research & Development for many specific wear problems. This includes areas such as: Tungsten Carbide (WC) selection, -size and -distributions, matrix compositions, application procedures and process equipment. The result of this extensive work is demonstrated by the hundreds of patents registered by Castolin Eutectic in the areas of wear protection and fusion technology during its 100-year history. Examples of products developed by Castolin Eutectic specifically for the oil and gas industry are:

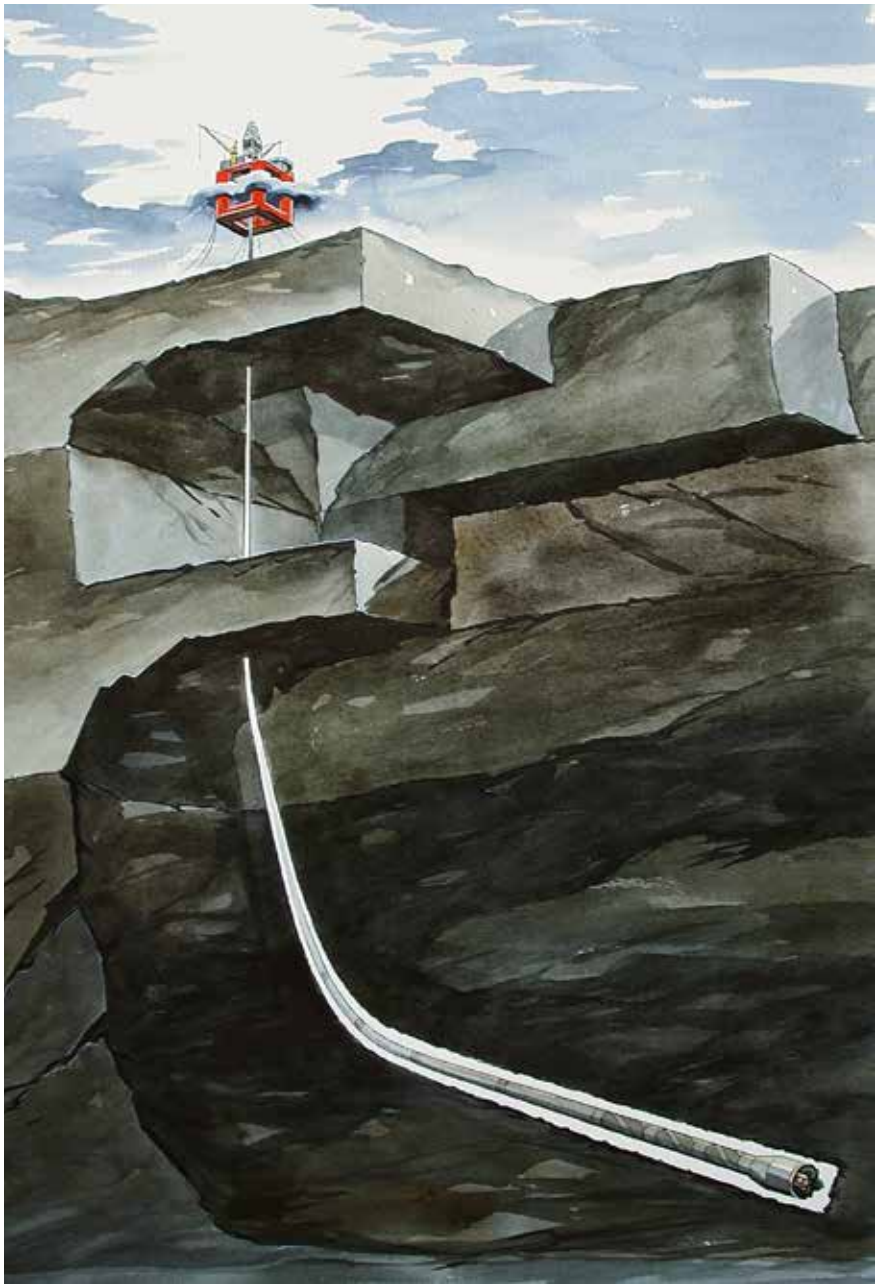
- Wear resistant cored wire for hard banding
- Non-magnetic alloys for use on Measurement While Drilling (**MWD**) tools and instrumentation
- Superior self-fluxing alloy for anti-corrosion coatings for combined H2S and NaCl environments
- Powder brazing processes; CastoDyn SF Lance and SuperJet Eutalloy
- Improved gas-atomised powder alloys for crack-free wear resistant deposits

The DrilTec® STC Coating system has been carefully designed to cover the needs for coatings on all components of the Bottom Hole Assembly (BHA) drilling tools. The high performance features of these coating systems will match customers' expectations and assist to improve today's drilling technology. Through use of carefully selected material and alloys, the wear performance has been maximized by combining an understanding of the wear and the choice of the right microstructure, combined with WC.



Laser spherical Tungsten Carbide coating

Powder manufacturing



1083

Drilling equipment and its application
Bottom Hole Assembly (BHA)

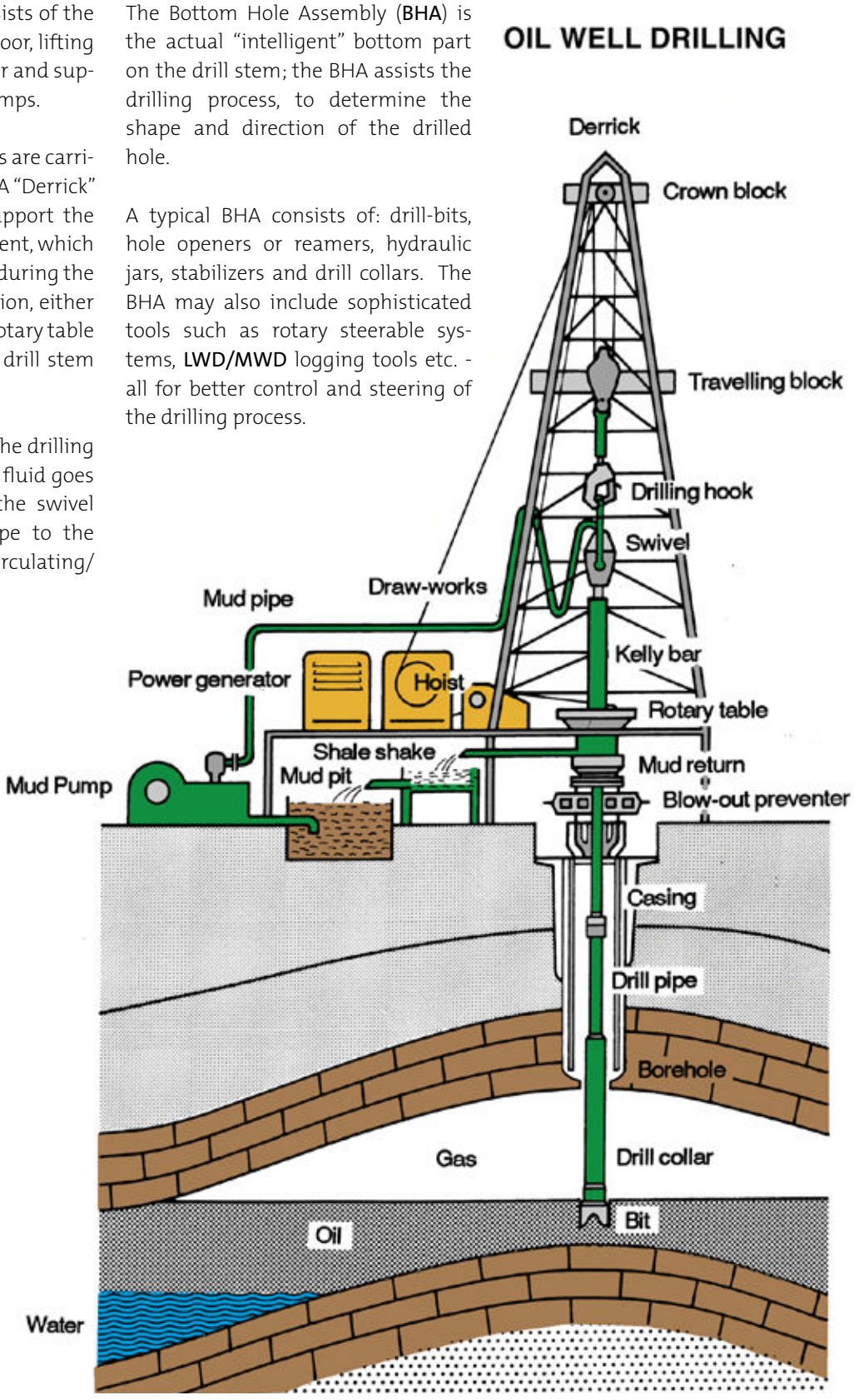
A standard drilling rig consists of the complex alliance of a drill floor, lifting hoists, a "Derrick" drill tower and supporting equipment and pumps.

Standard drilling operations are carrier out using rotary drilling. A "Derrick" lifting tower is used to support the drill pipe and other equipment, which has to be raised or lowered during the drilling operation. For rotation, either a "top drive" or traditional rotary table applies rotary force to the drill stem and the bit.

The mud pump circulates the drilling fluid. From the pumps, the fluid goes to the swivel, and from the swivel down through the drillpipe to the bit, for lubrication and recirculating/ cleaning of the drilled hole.

The Bottom Hole Assembly (**BHA**) is the actual "intelligent" bottom part on the drill stem; the BHA assists the drilling process, to determine the shape and direction of the drilled hole.

A typical BHA consists of: drill-bits, hole openers or reamers, hydraulic jars, stabilizers and drill collars. The BHA may also include sophisticated tools such as rotary steerable systems, **LWD/MWD** logging tools etc. - all for better control and steering of the drilling process.



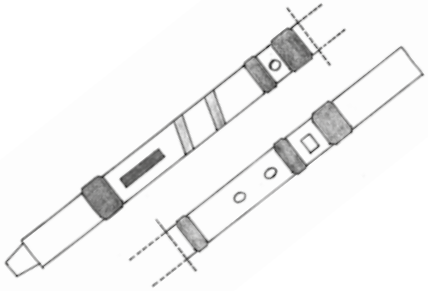
1083

Drill string tools and related applications/coatings

MWD/LWD (Logging while drilling)

To allow the drilling operation to find the right target area, the industry has developed and uses a variety of "GPS" tools, normally made out of non-magnetic materials. The tools are both complex and expensive pieces of equipment and therefore most often need protective coatings to withstand the drilling conditions.

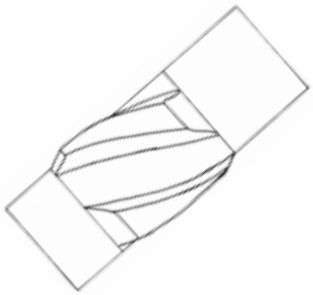
Typical STC coatings selection is:
DrilTec® STC 600 and 700



Rotary steerable systems

Rotary steerable systems are used to guide the drill string within the formation (well-placement) for maximum optimization of extraction. Different types of systems exist and some use a spiral stabilizer sleeve and others us mechanically or hydraulically operated steering pads. These tools are exposed to severe wear and have been coated for many years with different wear-resistant coatings. The parts are typically made from high quality steels, such as AISI 4145H, or non-magnetic materials.

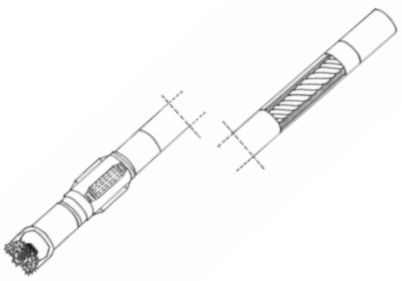
Typical STC coatings selection is:
DrilTec® STC 200, 400, 600 and 700



Drilling motors

During drilling, a drilling motor is used to power rotation of the drill bit, which is itself powered by the pressurized drilling fluid (mud) from the drill string. By choosing different configurations, it may deliver high torque or high speed rotation.

Typical STC coatings selection is:
DrilTec® STC 200, 400, 600 and 700



Fishing and milling tools

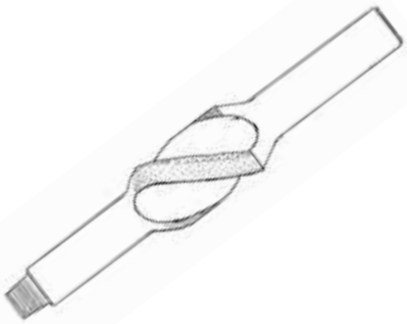
These are tools specially designed to perform cleaning of the drilled hole, removing (milling) sections of the casing or even removing a broken drill string (fishing). Typical coatings are Tungsten inserts, Tungsten rope, and Nickel Bronze composite rods with Tungsten.

Typical STC coatings selection is:
DrilTec® STC 100 and 200.

Stabilizers

The stabilizer's function is to keep the drill string centralized and to guide the drill bit to the target. Stabilizers are exposed to high wear and these have been coated for many years with various wear-resistant coatings, dependant on differing operating conditions. Typical coatings are Tungsten inserts, Tungsten rope, and Nickel Bronze composite rods with Tungsten. They are typically manufactured from high quality steels such as AISI 4145H or non-magnetic materials.

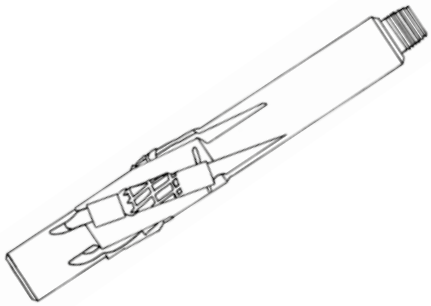
Typical STC coatings selection is:
DrilTec® STC 200, 400, 600 and 700



Reamers

Reamers are used to make holes slightly larger in sections of the well, and come in fixed or collapsible roller types. Wear-resistant coatings are normally applied on leading edges of the tool and body.

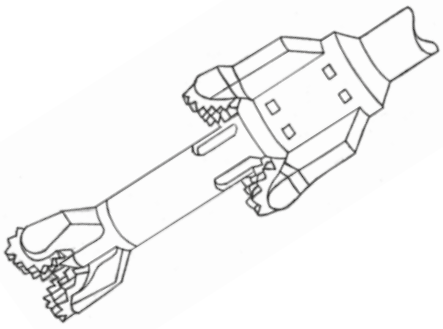
Typical STC coatings selection is:
DrilTec® STC 200, 400 and 600



Hole openers

A hole opener is a tool used to enlarge the borehole during a well drilling operation. It can be positioned either above the drill bit or above a pilot run, inside the existing bore hole.
Hole openers are used to make the borehole significantly bigger - up to 50" is typical. They can make a hole larger in either a single or multiple steps, in one run. We have a wide range of coatings suitable for protection of the bodies such as Tungsten rope and Nickel Bronze composite rods with Tungsten.

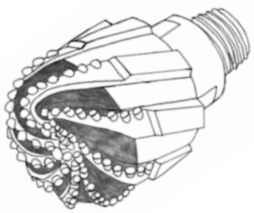
Typical STC coatings selection is:
DrilTec® STC 200 and 600



Drill bits

Drill bits of different designs are used for making the bore hole. Drilling in hard formations typically calls for tri-cone rotary rock bits. Fixed diamond bits are normally used for drilling in softer conditions. Protection of the cutters on tri-cone bits and bodies on both can be protected using our Tungsten carbide powder coatings with the Eutalloy process.

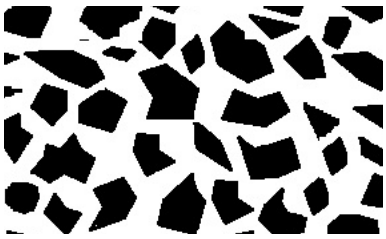
Typical STC coatings selection is:
DrilTec® STC 200 and 600

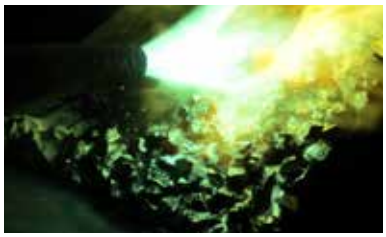


Coating system Menu

DrilTec® STC-100 Series

Our Composite Alloy Rod is made of crushed Tungsten Carbide (WC), embedded in a Nickel Bronze matrix with either sharp-edged cutting grade carbides for milling and cutting operations, or our wear grade, with slightly rounded edges, for applications such as stabilizers and wear pads.



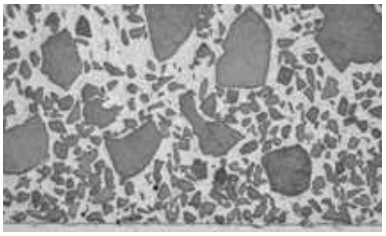


Process description

The composite rods are normally applied using a large oxy-acetylene torch, in conjunction with a range of our brazing fluxes or with our gas flux system, where the flux is introduced to the gas before the flame, thus making it easier for the operator to place the cutting carbides in the correct position. To prevent leaching of the Nickel Bronze alloy, a thin tinning layer of our powder from the STC 400 series is applied using our SuperJet Eutalloy S. A typical example of powder would be STC-326LT but most of our 400 series powders can be used. Pre-heats are determined by the base metal.

DrilTec® STC-200 Series

Our Composite Flexible Rope or Rod is made of either crushed or spherical carbides embedded in a NiCrBSi matrix which exhibits exceptional wear resistant properties on a wide range of tools.

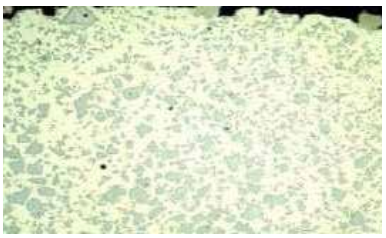


Process description

The coating is applied using a large Oxy-Acetylene torch, having first mechanically cleaned the surface and tinned it using our SuperJet Eutalloy S torch and powder from our DrilTec STC 400 series. Pre-heat is governed by the base metal of the component being coated. The rope is applied using a slightly carburizing flame to melt the rope and bond it to the base material. On very small components, TIG can be used, but this may reduce the wear-properties of the alloy.

DrilTec® STC-300 Series

The STC-300 series consists of gas-shielded Metal Arc Welding, using either Ni- or Fe-cored wires, with Tungsten Carbide (WC) particles in the core. Also in this series, we have cored wires suitable for either TIG or Oxy-Acetylene welding, again with WC particles in the core, along with fluxing agents.

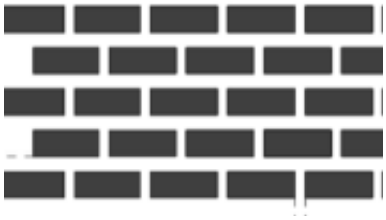


Process description

The coatings are applied onto a clean surface and pre-heat is based on the base material to be coated. This range can be applied using TIG or Oxy-Acetylene welding for the standard cored rods, or by MIG/MAG for the cored wire supplied on spools. The MIG/MAG version is ideal for automated or semi-automated welding in OEM applications.

DrilTec® STC-400 Series

Our DrilTec STC 400 series are coatings based on bonding sintered Tungsten Carbide Inserts (TCI) onto a tool body, using powder welding technology. The most commonly used powders are Nickel-based. However, powders containing Tungsten Carbide (WC) can also be used for filling between the inserts. The process can be used to apply a wide range of insert sizes and shapes, one of the most commonly used sizes are 13 to 15mm with width of 5mm and thickness varying from 3 to 4mm.



Process description

The surface to be protected is mechanically cleaned and then pre-heated; a thin layer of powder is then applied. Using a SuperJet Eutalloy torch, the inserts to be bonded to the surface are pre-heated and a thin layer of powder is applied to one side. A brick pattern is laid out on the component to be protected; the spacing is typically 3mm, but this can be adjusted, according to specifications. Using the SuperJet C Torch and our C6 tip, the inserts are bonded to the surface and the gaps are flood-filled with a Nickel-based powder such as OTP 126, OTP 331LT or OTP 220NM (for non-magnetic applications).

DrilTec® STC-600 Series

Flame-sprayed powder coating system that allow you to deposit a wide range of Tungsten Carbide (WC) and Nickel Chrome boron powders to give superb wear resistance to a range of components. The coating systems allow you to deposit very thin overlays, from 0.5mm up to 5-6mm, either in single pass or multiple passes, with very low dilution and minimal changes in the carbides.

Process description

Eutalloy Super Jet S - Manual spray and fuse process, utilizing the well-known Eutalloy SuperJet S powder oxy-acetylene welding/spray gun. This is ideal for manually applying thin layers on complex shapes such as hole-openers and allows full control of deposits from 0.5mm up to 6mm. A wide range of Nickel-based alloys, as well as powders with a Nickel matrix and WC in varying percentages. Non-magnetic powders are also available for specific applications.

SF-Lance - The SF lance is a similar process to the Eutalloy but is designed for automated high-deposition rate coatings in large repair facilities, as well as OEM applications. A similar range of alloys are available as for the Eutalloy SuperJet S, above.

DrilTec® STC-700 PTA Series

The 700 series utilizes the Plasma Transferred Arc (PTA) to apply many different types of alloys, both for wear resistance with high levels of Tungsten Carbide (WC) in a tough matrix, and for corrosion resistant- and non-magnetic materials. We also have non-magnetic alloys with varying levels of WC. All have very low levels of base metal dilution compared with conventional arc welding processes.

Process description

The PTA process focuses a plasma beam through a heat resistant nozzle. The welding filler alloy, in the form of micro-atomized powder, is conveyed into the plasma arc column in an inert gas stream. A shielding gas protects the weld pool from the atmosphere. The resulting coating has very low dilution compared to conventional arc welding processes such as MMA, MIG/MAG or TIG. The coating structure can be optimized by varying the parameters of the system. It is ideal for automation and on a typical stabilizer coated with a WC alloy the final grinding-time is dramatically reduced. The process is also ideal for applying our range of non-magnetic alloys.

DrilTec® STC-100 Series

DrilTec® STC-100 Series

Our Composite Alloy Rod is made of crushed Tungsten Carbide (WC) embedded in a nickel bronze matrix with either sharp edged cutting grade carbides for milling and cutting operations, or our wear grade with slightly rounded edges for applications such as stabilizers and wear pads.

Process description

The Composite Alloy Rods are normally applied using a large oxy-acetylene torch, in conjunction with a range of our brazing fluxes or with our gas flux system where the flux is introduced to the gas before the flame, thus making it easier for the operator to place the cutting carbides in the correct position. To prevent leaching of the nickel bronze alloy, a thin tinning layer of our powder from the STC 400 series is applied using our SuperJet Eutalloy S, a typical example of powder would be STC-326LT but most of our 400 series powders can be used. Pre-heats are determined by the base metal.

DrilTec® STC-130 Composite Alloy Rod Cutting Grade

DrilTec® STC-130 Composite Alloy Rod Cutting consists of cutting grade; cobalt sintered grade WC, embedded in a ductile matrix of high strength nickel-bronze alloy. The weldability is superb and goes down very easily; the alloy is offered with a range of different flux products matching the applications needs.

Applications

The deposit offers an outstanding cutting property when used in milling and material-removing applications, and still offers a very high wear resistance

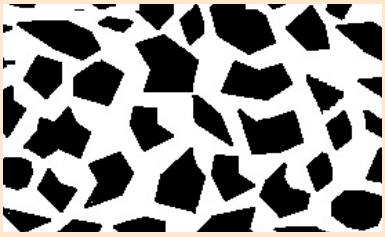
Typical applications are down hole tools such as reamers and hole openers, junk mills, milling tools, fishing tools and stabilizers.

Properties

Carbide content: 70% Sintered WC
Matrix alloy melting range:
880°C (1616°F) Solidus (minimum)
920°C (1688°F) Liquidus (maximum)
Typical rod weight: 400grams (0,88Lbs)

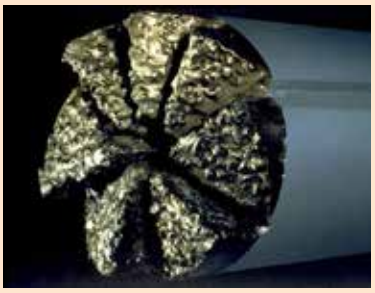
Carbide sizes

Product name:	millimeters	inches
OTH 6-16C	1,6 – 3,2 mm	1/8" – 1/16"
OTH 6-32C	3,2 – 4,8 mm	3/16" – 1/8"
OTH 6-48C	4,8 – 6,35 mm	1/4" – 3/16"
OTH 6-64C	6,35 – 8,0 mm	5/16" – 1/4"
OTH 6-125C	9,5 – 12,5 mm	½" – 3/8"
OTH 6-80C	8,0 – 9,5 mm	3/8" – 5/16"
OTH 6-125C	9,5 – 12,5 mm	½" – 3/8"



DrilTec® STC-100 Series

DrilTec® STC-135 Composite Alloy Rod Wear Grade



DrilTec® STC-135 Composite Alloy Rod Wear Grade consists of wear grade, cobalt sintered grade WC, embedded in a ductile matrix of high strength nickel-bronze alloy. The weldability is superb and goes down very easily, the alloy is offered with a range of different flux products matching the applications needs

Applications

The deposit offers outstanding properties when used in wear applications, and still offers a very high wear resistance.

Typical applications are down hole tools such as reamers, hole openers and stabilizers.

Properties

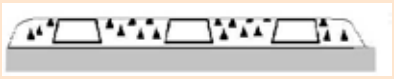
Carbide content: 60% Sintered WC
Matrix alloy melting range:
880°C (1616°F) Solidus (minimum)
920°C (1688°F) Liquidus (maximum)
Typical rod weight: 400grams (0,88Lbs)

Carbide sizes

Product name:	millimeters	inches
OTH 6-24-40W	0,35 – 0,7 mm	24 – 40 Mesh
OTH 6-14-24W	0,7 – 1,2 mm	14 – 24 Mesh
OTH 6-10-18W	0,8 - 1,6 mm	10 – 18 Mesh
OTH 6-16W	1,6 – 3,2 mm	1/8" – 1/16"
OTH 6-32W	3,2 – 4,8 mm	3/16" – 1/8"
OTH 6-48W	4,8 – 6,35 mm	1/4" – 3/16" 3/16"
OTH 6-64W	6,35 – 8,0 mm	5/16" – 1/4"

DrilTec® STC-100 Series

DrilTec® STC-140WC - TRAPEZ + STC 135



DrilTec® STC-140 WC-Tungsten Carbide TRAPEZ + STC 135 consists of wear grade cobalt sintered WC. Inserts are embedded in a ductile matrix of high strength Nickel-Bronze alloy. It has superior weldability and is offered with a range of fluxes, to match the application requirements. The wear properties of the coating can be further improved by distributing the TRAPEZ Tungsten Carbide Inserts evenly.

Applications

The deposit offers an outstanding property when used in wear applications, and still offers a very high wear resistance.

Typical applications are down hole tools like reamers, hole openers and stabilizers.

Coating Components

Tungsten Carbide Inserts

Tiles: OTC Standard Tungsten Carbide Inserts Co bonded (Magnetic)
Grade: CMT24RC

Tungsten Carbide-Insert		
TRAPEZ	25 x 6/9 x 6 mm	1 x 3/16-5/16 x 3/16”

Nickel-based - Matrix flood filling materials

Description: STC 135 Nickel based-powders
Matrix alloy melting range:
880°C (1616°F) Solidus (minimum)
920°C (1688°F) Liquidus (maximum)
Typical rod weight: 400grams (0,88Lbs)

Carbide sizes

Product name:	millimeters	Inches
OTH 6-24-40W	0,35 – 0,7 mm	24 – 40 Mesh
OTH 6-14-24W	0,7 – 1,2 mm	14 – 24 Mesh
OTH 6-10-18W	0,8 - 1,6 mm	10 – 18 Mesh
OTH 6-16W	1,6 – 3,2 mm	1/8" – 1/16"
OTH 6-32W	3,2 – 4,8 mm	3/16" – 1/8"
OTH 6-48W	4,8 – 6,35 mm	1/4" – 3/16" 3/16"
OTH 6-64W	6,35 – 8,0 mm	5/16" – 1/4"

1083

DrilTec® STC-100 Series

Supporting products

Tinning Rods

Tinning rod	Size mm/Inch	Length
OTB 6T4-18	3,2 mm (1/8”)	500mm
OTB 6T4-18F	3,2 mm (1/8”)	500mm
OTB 6T4-316	4,8 mm (3/16”)	500mm
OTB 6T4-316F	4,8 mm (3/16”)	500mm

Tinning rods are available in either bare or flux coated

Fluxes

Fluxes		
OTB 6F Paste		
OTB 6F Std Dry		

Gas flux apparatus

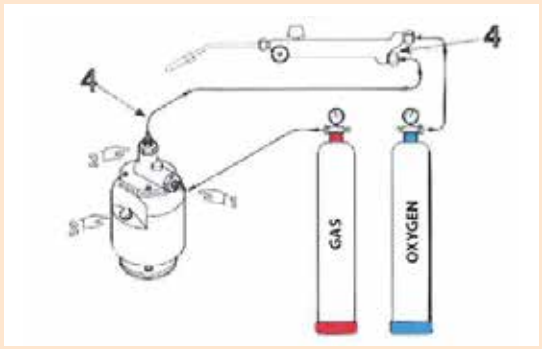
Apparatus	Size	
OTB GF System	2L	

The OTB 6FGF Eco is a non toxic, environmentally friendly “Non-Methanol” based gas flux.

Gas Fluxes

Gas Fluxes	Size	Package type
OTB 6FGF Eco	10L	Plastic can

Gas flux system overview



1083

DrilTec® STC-200 Series

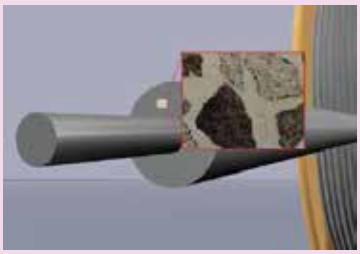
DrilTec® STC-200 Series

Medium to large Tungsten Carbide (WC) particles embedded in Nickel matrix. Our composite flexible rope or rod alloy is made of crushed WC embedded in a NiCrBSi alloy matrix with high anti-wear performance properties.

Process description

The coating is applied using a large Oxy-Acetylene torch, having first mechanically cleaned the surface and tinned it using our SuperJet Eutalloy S torch and powder from our DrilTec STC 400 series. Pre-heat is governed by the base metal of the component being coated. The rope is applied using a slightly carburizing flame to melt the rope and bond it to the base material. On very small components, TIG can be used, but this may reduce the wear-properties of the alloy.

DrilTec® STC-240 Rope



DrilTec® STC-240 Rope is a high-performance anti-wear product in the form of a flexible cord, comprising a Nickel-cored wire, covered with an elastic binder containing a mixture of carbides and nickel alloy powder. DrilTec® STC-240 Rope deposits an extremely durable protective coating comprising a dense mass of ultra-hard WC, embedded in a tough Nickel Chromium alloy matrix. This structure offers extremely effective protection against erosive and abrasive attack by a wide variety of materials.

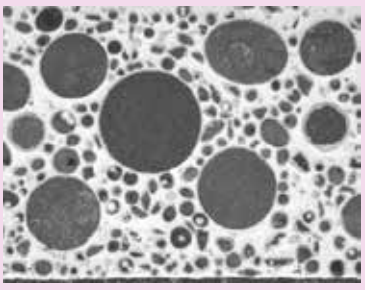
Applications

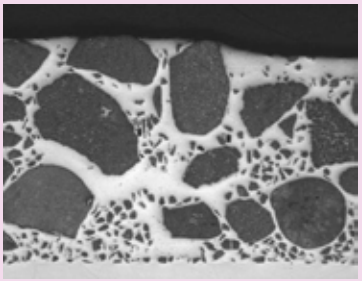
The deposit offers a very high wear resistance. The alloy system offers a unique re-application capability where previously coated but now worn tools can easily be refurbished.

Typical applications are down hole tools such as stabilizers, hole openers and reamers, fauge applications on casing mills and other milling tools.

Properties

Carbide content: 65%
Hardness
Carbide (HV1): 2300 – 2600
Matrix (HV30): 400 - 500
Matrix alloy melting range: 1050 °C (1616°F) Solidus (minimum)
1120°C (1688°F) Liquidus (maximum)
Typical spool weight: 16Kg (35,5Lbs)





Product name	Rope dia. size (mm)	Carbide size (mm)
OTH 6-36x6	6,0 mm	0.2 - 0.7
OTH 6-35x8	8,0 mm	0.2 - 1.2
OTH 6-38	8,0 mm	0.2 - 1.6
OTH 6-38SH*	8,0 mm	0.2 - 1.2

* Spherical carbides - Spherical carbide Hardness (HV1) 3500 - 4200

1083

DrilTec® STC-200 Series

DrilTec® STC-260 Composite Alloy Rod

DrilTec® STC-260 Composite Alloy Rod deposits an extremely durable protective coating comprising a dense mass of ultra-hard WC, embedded in a tough self-fluxing Nickel alloy matrix. This structure offers extremely effective protection against abrasive attack by a wide variety of hard and abrasive formations.

Applications

The deposit offers a very high wear resistance. The alloy system offers a unique re-application capability where previously coated but now worn tools can easily be refurbished.

Typical applications are down hole tools such as stabilizers, hole openers and reamers, gauge applications on casing mills and other milling tools.

Properties

Carbide content: 65%
Hardness Carbide
(HV1): 2300 – 2600
Matrix (HV30): 400 - 500
Matrix alloy melting range: 1050 – 1150°C
Composite rod size:
Length: 450 mm
Unit weight 500 gram
Package weight 10 kg

Carbide sizes

Product name	Carbide size (mm)	Carbide size (inch)
OTH 6-16NiWC	1,6 – 3,2 mm	1/8" – 1/16"
OTH 6-32NiWC	3,2 – 4,8 mm	3/16" – 1/8"
OTH 6-48NiWC	4,8 – 6,35 mm	1/4" – 3/16"
OTH 6-64NiWC	6,35 – 8,0 mm	5/16" – 1/4"
OTH 6-80NiWC	8,0 – 11,0 mm	3/8" – 5/16"

DrilTec® STC-300 Series

DrilTec® STC-300 Series

Composite Fe-based, Tungsten Carbide (WC) filled tubular rod for both gas welding and gas-shielded metal arc welding.

Composite Ni-based and Fe-based flux- cored welding wires filled with WC, for use with MIG/MAG welding systems.

Process description

The coatings are applied onto a clean surface and pre-heat is based on the base material to be coated. This range can be applied using TIG or Oxy-Acetylene welding for the standard cored rods, or by MIG/MAG for the cored wire supplied on spools. The MIG/MAG version is ideal for automated or semi-automated welding in OEM applications.

DrilTec® STC-310 Composite Rod

DrillTec® STC-310 is an iron based Fe-Tube filled with Tungsten Carbides. The deposit offers a very high wear resistance. The alloy system offers a unique re-facing capability where re-application of worn tools can easily be recoated.

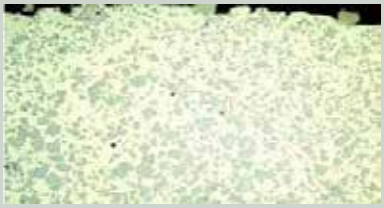
Applications

Typical applications are down hole tools like coating or re-tipping roller cone, drill bits and hole opener cutter wheels.

Properties

Carbide content: 65%
Hardness Carbide (HV1): 2300 – 2600
Matrix (HV30): (HV30): 300 - 350

Product description



Carbide sizes

Product name:	Rod dia. size (mm)	Carbide size (mm)
OTH 7-16Fe	3,5 mm	1,6mm
OTH 7-32Fe	5,0 mm	3,2mm

DrilTec® STC-300 Series

DrilTec® STC-350 Composite Wire

WC in an Iron Metal cored wire for highly abrasion and corrosion resistant coatings.

The deposit offers a very high wear resistance. The alloy system offers a unique re-facing capability where re-application of worn tools can easily be recoated.

Applications

Typical applications are down hole tools such as stabilizers, hole openers and reamers, gauge applications on casing mills and other milling tools.

Properties

Carbide content: 60%
Hardness Carbide (HV0,3): 2300
Matrix (HRC): 55
Diameter Wire: 1,6 mm
Typical spool weight: 15Kg (35,5Lbs)

Product name:	Diam.	Package
OTW 63FeWC	1,6 mm	15Kg

DrilTec® STC-360 Composite Wire

Metal-cored wire with WC in Nickel-based matrix for maximum abrasion resistance in corrosive media. The deposit offers a very high wear resistance. The alloy system offers a unique re-facing capability where re-application of worn tools can easily be recoated.

Applications

Typical applications are down hole tools such as stabilizers, hole openers and reamers, gauge applications on casing mills and other milling tools.

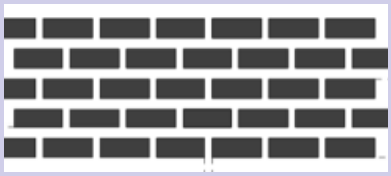
Properties

Carbide content: 60%
Hardness Carbide (HV0,3): 2300
Matrix (HRC): 52
Diameter Wire: 1,6 mm
Typical spool weight: 15Kg (35,5Lbs)

Product name:	Diam.	Package
OTW 65NiWC	1,6 mm	15Kg roll

DrilTec® STC-400 Series

DrilTec STC-400 Series



Our DrilTec STC-400 Series are coatings based on applying Tungsten Carbide Inserts (TCI) attached to a tool body by a powder spray deposit, most commonly used in Nickel-based alloys, although other alloys exists.

The process can apply a variety of different shaped TCI. The most popular types are either 13 or 15 mm long 5mm wide with a 3 or 4mm thickness; the spacing is typically 3mm but can vary according to customer specifications.

Process description

The surface to be protected is mechanically cleaned and then pre-heated; a thin layer of powder is then applied. Using a SuperJet Eutalloy torch, the inserts to be bonded to the surface are pre-heated and a thin layer of powder is applied to one side. A brick pattern is laid out on the component to be protected; the spacing is typically 3mm, but this can be adjusted, according to specifications. Using the SuperJet C Torch and our C6 tip, the inserts are bonded to the surface and the gaps are flood-filled with a Nickel-based powder such as OTP 126, OTP 331LT or OTP 220NM (for non-magnetic applications).

DrilTec® STC-420

DrilTec STC-420 coating system consists of a range of carefully developed and selected performance products for maximum wear protection on drilling tools.

DrilTec STC-420 coating uses Ni-based metal powders to bond the TCI fully to the substrate. The coating will fuse the components together in a very wear-resistant coating layer.
The deposit offers a very high wear-resistance.

Applications

Typical applications are down hole tools like stabilizers, non-magnetic stabilizers, reamers, undergauge reamers, gauge applications.

Coating Components -

Tungsten Carbide Inserts

OTC Standard TCI Co bonded (magnetic)
Grade: CMT24RC

Product name:	WC insert size (mm)	Package size
OTC 5-25X3	25X5X3	1000
OTC 5-25X4	25X5X4	1000
OTC 5-13X3	13X5X3	2500
OTC 5-13X4	13X5X4	2000
OTC 5-6X4	6X5X4	500

1083

DrilTec® STC-400 Series

(Tungsten Carbide Inserts contd)

OTC non-magnetic TCI Nickel (Ta, Nb) bonded
Grade: CTM16O

Product name:	WC insert size (mm)	Package size
OTC 5-25X3 NM	25X5X3	1000
OTC 5-25X4 NM	25X5X4	1000
OTC 5-13X3 NM	13X5X3	2500
OTC 5-13X4 NM	13X5X4	2000
OTC 5-6X4 NM	6X5X4	500

Nickel-based - Matrix flood filling materials

Description: Nickel-based powders

Product name:	Hardness typical	Packages
OTP 126	25-27Hrc	4,5 kg
OTP 120	19-22Hrc	4,5 kg
OTP 134	30-35Hrc	4,5 kg

Description: Special low-melting fusion powders

Product name:	Hardness typical	Packages
OTP 326 LT	25-27Hrc	4,5 kg
OTP 331 LT	30-32Hrc	4,5 kg
OTP 335 LT	34-36Hrc	4,5 kg

Description: Nickel-based powder for low-hardness non-magnetic applications

OTP 220 NM	18-22Hrc	4,5 kg

DrilTec® STC-430

DrilTec STC-430 coating system consists of a range of carefully developed and selected performance products which obtain maximum wear protection on Drilling tools etc.

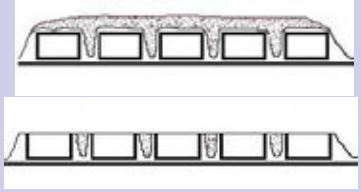
DrilTec STC-430 coating uses Ni-based metal powders to bond the TCI fully to the substrate; the coating will fully fuse the components together in a very though coating layer.

Coating Structure

The coating typically demonstrates a higher amount of WC exposed in the surface, the percentage would be around 65- 75% over standard tile and Nickel coating 3mm distance and 13X5.

Applications

The deposit offers an even higher wear-resistance.
Typical applications are down hole tools like stabilizers, non-magnetic stabilizers, reamers, undergauge reamers, gauge applications.



1083

DrilTec® STC-400 Series

Coating Components -

TCI sizes

Product name:	Tungsten Carbide Insert size (mm)	Package size
OTC 5-25X3	25X5X3	1000
OTC 5-25X4	25X5X4	1000
OTC 5-13X3	13X5X3	2500
OTC 5-13X4	13X5X4	2000
OTC 5-6X4	6X5X4	500

Flood Filling Consumables

Description: Nickel-based powders

Product name:	Hardness typical	Packages
OTP 126	25-27Hrc	4,5 kg

Description: Ni-WC powder (55% WC content)

Product name:	Hardness typical	Packages
OTP 435	50-55 + WC	4,5 kg

Equipment

Eutalloy Super Jet-S is our premium coating system, specially adapted for DrilTec STC-400 coating system.

Instructions and procedures

Instructions for applying the tiling process can be obtained from your customer service contact.

Training

Castolin Eutectic offers comprehensive training for this type of hardfacing process. Training courses (typically 4-day), tailored to the customers' needs, covers all aspects of this coating process, including : design, preparation, pre-heating, pre-coating, tiling/applying the coating, finishing and control.

Auxiliary equipment

Stands, grinding disks, protective gear, gauges and rings.

1083

DrilTec® STC-600 Series

DrilTec® STC-600 Series

A coating system that applies Tungsten Carbide (WC) particles in a Nickel powder matrix.

Process description

Eutalloy Super Jet S - Manual spray and fuse process, utilizing the well-known Eutalloy SuperJet S powder Oxy-Acetylene welding/spray gun. This is ideal for manually applying thin layers on complex shapes such as hole-openers and allows full control of deposits from 0.5mm up to 6mm. A wide range of Nickel-based alloys, as well as powders with a Nickel matrix and WC in varying percentages. Non-magnetic powders are also available for specific applications.

SF-Lance - The SF lance is a similar process to the Eutalloy but is designed for automated high-deposition rate coatings in large repair facilities, as well as OEM applications. A similar range of alloys are available as for the Eutalloy SuperJet S, above.

DrilTec® STC-620
Manual or Semi-automatic process

DrilTec STC-620 coating system consists of a range of carefully developed and selected performance products for maximum wear-protection on drilling tools.

DrilTec STC-620 coating uses Ni-based metal powders to bond the WC fully to the substrate, the coating will fuse the components together in a very wear-resistant coating layer.

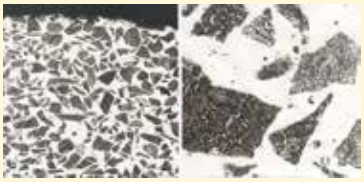
Applications

Typical applications are down hole tools like stabilizers, non-magnetic stabilizers, reamers, undergauge reamers, gauge applications.

Properties

The coating typically consists of a water or gas-atomized Ni-Cr-B-Si matrix.
Including very hard WC particles with sizes between 30-130 microns.
The WC ratio is 50 to 60% content by weight.

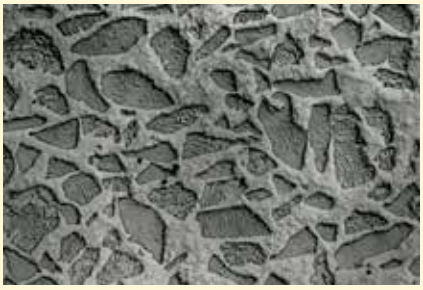
Product name:	Hardness typical	Packages
OTP 435	50Hrc	4,5 kg
OTP 412	60Hrc	4,5 kg



1083

DrilTec® STC-600 Series

DrilTec® STC-640
Automated coating process



DrilTec STC-640 coating system consists of a range of carefully developed and selected performance products to obtain maximum wear protection on drilling tools.
The coating uses Ni-based metal powders to bond the Tungsten Carbide (WC) fully to the substrate; the coating fuses the components together in a very wear-resistant coating layer. The deposit offers a very high wear resistance.

Applications

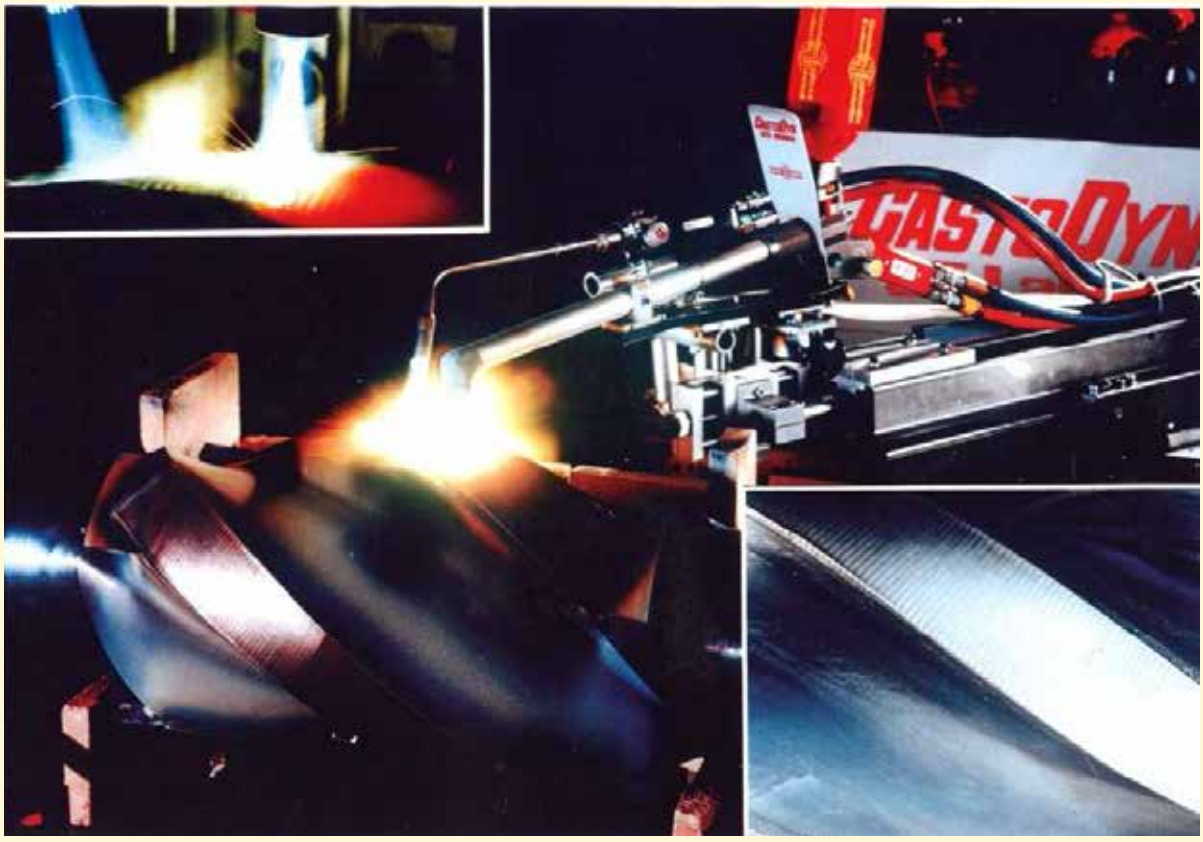
Typical applications are down hole tools like stabilizers, non-magnetic stabilizeres, reamers, undergauge reamers, gauge applications.

Properties

The coating typically consists of a gas-atomised Ni-Cr-B-Si matrix; very hard WC particles, size between 30-180 microns with a ratio of 50 to 70% content by weight.

Coating components -

Product name:	Hardness typical	Packages
OTP 455	55Hrc	4,5 kg
OTP 457	62Hrc	4,5 kg



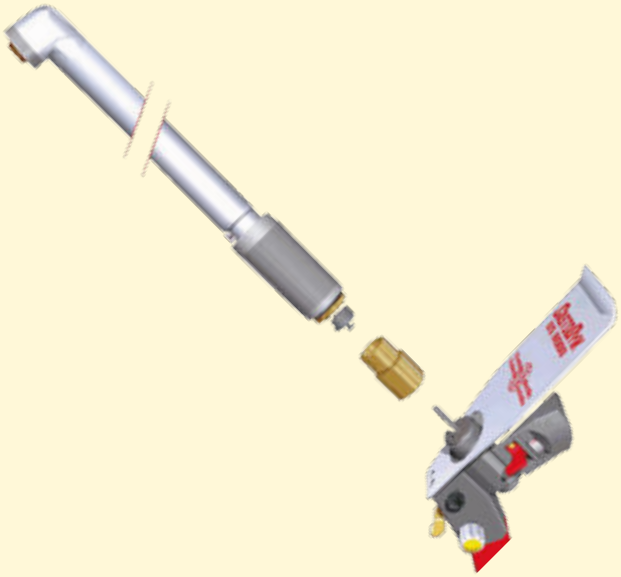
1083

DrilTec® STC-600 Series

Equipment

SuperJet Eutalloy S
C6 Air-cooled tip

SF Lance



DrilTec® STC-700 Series

DrilTec STC-700 PTA Series

Our DrilTec STC-700 Series are coatings based on applying Tungsten Carbide (WC) /Ni alloy matrix coatings, by use of the Plasma Transferred Arc (PTA) Process.

Designed to withstand rough environments, our carbide PTA powders meet the tough challenges of the drilling & exploration industry.

Process description

The EuTronic® GAP is the Castolin Eutectic PTA process, ideal for joining and coating operations.

In the PTA process, the plasma is focused while forced through the heat resistant anode, causing a considerable increase of the arc density, energy and temperature. The welding filler alloy, in microatomised powder or cold wire form, is conveyed into the plasma arc column where a shielding gas protects the weld pool from the atmosphere. The plasma arc and the heat input can be far better controlled than a conventional electric arc, and the energy is almost completely spent to melt the filler metal, reducing the heat input and dilution to a minimum.

PTA technology provides a wide range of benefits compared with conventional arc welding processes:

- High energy density in an extremely focused arc
- High deposition rates for shorter welding times
- Homogeneous, pore- and spatter-free coatings
- Lower dilution, heat input, distortions and Heat Affected Zone than any other arc welding process
- Ideal control of the deposit thickness
- Maximum purity and performance of the alloy
- Smoother surface for lower machining costs
- Exceptional reproducibility
- Suitable also for fully automated processes and also when compared with the spray and fuse process
- Higher bond strength and impact resistance
- Lower overspray and smoother deposits, reducing the after-welding machining costs
- Thicker coatings allowed
- Lower heat input
- Minimum distortions

All these features make the PTA process ideal for those operations where extra precision, low-heat input and -distortions are needed.

DrilTec® STC-700 Series

DrilTec STC-720

A series of proprietary nickel-based, composite hardfacing powder, containing WC.
The alloy is designed to be applied over those surfaces of steel, stainless steel, cast iron and nickel-based alloys that are subject to abrasion, corrosion, impact or any combination thereof.

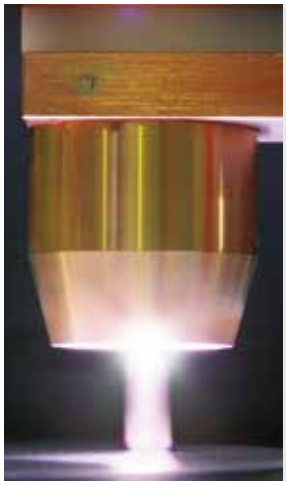
Deposits are hard and smooth, and resist abrasion and friction because the WC particles are evenly distributed throughout the matrix.

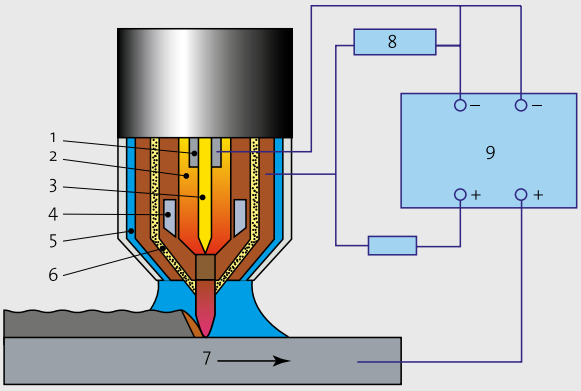
Applications

- stabilizer and hardbanding applications
- oil sand processing equipment
- decanter and transport screws
- downhole tools
- shovel bucket teeth, shrouds and adapters

Properties

Product name:	Packages
OTP 442	4,5 kg
OTP 450 S	4,5 kg
OTP 438 S	4,5 kg
OTP 446	4,5 kg
OTP 460	4,5 kg





1) Cathode holding device
2) Plasma gas
3) Cathode
4) Cooling water
5) Shielding gas
6) Feeding gas and powder
7) Welding direction
8) Ignition
9) Double power supply

1083

DrilTec® STC-700 Series
Product description

OTP 442

OTP-442 is a proprietary Nickel-based, composite hardfacing powder containing 25% Tungsten Carbide (WC).

Applications

Non-magnetic drill collars, flex weights, LWD/MWD tools, low- to medium-wear areas.

Properties

Typical Composition:	matrix:	proprietary Ni-based alloy
	tungsten carbide:	Cast/crushed WC-W2C
Carbide to Matrix Ratio (Weight %):	25/75	
Matrix Particle Size	-100 +325 mesh	(-150 +44 µm)
Carbide Particle Size:	-100 +230 mesh	(-150 +63 µm)
Maximum Operating Temperature:	matrix: approximately 1200°F	(650°C)
Bonding Mechanism:	metallurgical	
Matrix Hardness:	30-35 HRc	
Tungsten Carbide Hardness:	2400 HV	
Magnetic Properties:	Non-magnetic 1.005 per API Specification 7, Section 8.3.2.2.1	
G65 Wear Test Results:	126 mm3 volume loss	
Thickness Limit:	up to 3 mm per pass	

OTP 450S

OTP 450S is a proprietary Nickel-based, composite hardfacing powder containing 60% spherical Tungsten Carbide (WC). Non-magnetic properties.

Applications

Non-magnetic and steel components like; Drill collars, Flex weights, LWD/MWD tools, medium- to high-wear areas.

Properties

Typical Composition:	matrix:	proprietary Ni-based alloy
	tungsten carbide:	Spherical Eutectic WC
Carbide to Matrix Ratio:	55/45	
Matrix Particle Size	-140 +325 mesh	(-106 +44 µm)
Carbide Particle Size:	-140 +230 mesh	(-106 +44 µm)
Melting Temperature:	matrix: approximately 2200°F	(1200°C)
Maximum Operating Temperature:	matrix: approximately 1200°F	(650°C)
Bonding Mechanism:	metallurgical	
Hardness:	matrix: 40 -45 HRc	
Carbide:	3100 - 4000 HV	
Magnetic Properties:	Non-magnetic	
Density:	lbs/in3	(g/cm3)
Thickness Limit:	up to 3 mm per pass	
Color:	grey	
Spray Rate:	5-15 lbs/hr	(2.2-6.8 kgs/hr)

DrilTec® STC-700 Series

OTP 438S

OTP 438S is a medium hardness low-melting proprietary Nickel-based, composite hardfacing powder, containing 70% spherical Tungsten Carbide (WC).
Non-magnetic properties.

Applications

Non-magnetic and steel components like; Drill collars, Flex weights, LWD/MWD tools, medium- to high-wear areas.

Properties

Typical Composition:	matrix:	proprietary Ni-based alloy
	tungsten carbide:	macro crystalline WC
Carbide to Matrix Ratio:	70/30	
Matrix Particle Size	-100 +325 mesh	(-150 +44 µm)
Carbide Particle Size:	-100 +230 mesh	(-160 +63 µm)
Melting Temperature:	matrix: approximately 1600-2200°F	(860 - 1200°C)
Maximum Operating Temperature:	matrix: approximately 1200°F	(650°C)
Bonding Mechanism:	metallurgical	
Matrix Hardness:	matrix: 35 -40 HRc	
Tungsten Carbide Hardness:	3100 - 4000 HV	
Magnetic Properties:	Non-magnetic	
Thickness Limit:	up to 3 mm per pass	

DrilTec® STC-700 Series

OTP 446

OTP-446 is a proprietary Nickel-based, composite hardfacing powder containing 60% mono-crystalline Tungsten Carbide (WC).

Applications

Non-magnetic steel and steel-stabilizers, mandrel and motor sleeves, rotary steerable pads, reamers, steel components, tools made of AISI 4130 to 4145 steel.

Properties

Typical Composition:	matrix:	proprietary Ni-based alloy
	Tungsten Carbide:	macro crystalline WC
Carbide to Matrix Ratio (Weight %):	60/40	
Matrix Particle Size	-100 +325 mesh	(-150 +44 µm)
Carbide Particle Size:	-100 +230 mesh	(-150 +63 µm)
Melting Temperature:	matrix: approx.. 1600-2200°F	(860 - 1200°C)
Maximum Operating Temperature:	matrix: approximately 1200°F	(650°C)
Bonding Mechanism:	metallurgical	
Matrix Hardness:	30 -35 HRc	
Tungsten Carbide Hardness:	2400 HV	
Magnetic Properties:	Non-magnetic	
Thickness Limit:	up to 3 mm per pass	

OTP 460

OTP-460 is a proprietary Nickel-based, composite hardfacing powder containing Tungsten Carbide (WC). For surfacing non-alloy, low alloy and high- alloy steels and corresponding cast steels.

Applications

Steel-stabilizers, mandrel and motor sleeves, rotary steerable pads, reamers, steel components, tools made of AISI 4130 to 4145 steel.

Properties

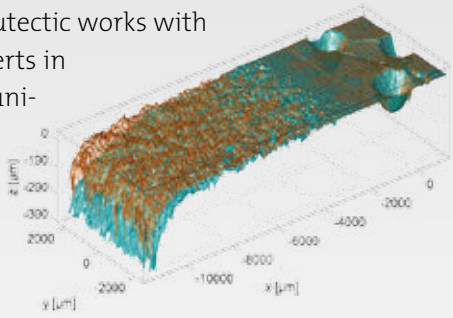
Typical Composition:	matrix:	proprietary Ni-based alloy
	Tungsten Carbide:	macro crystalline WC
Carbide to Matrix Ratio (Weight %):	60/40	
Matrix Particle Size	-90 +230 mesh	(-180 +63 µm)
Carbide Particle Size:	-90 +230 mesh	(-150 +63 µm)
Melting Temperature:	matrix: approximately 2200°F	(860 - 1200°C)
Maximum Operating Temperature:	matrix: approximately 1200°F	(650°C)

DrilTec® STC-700 Series

Bonding Mechanism:	metallurgical	
Matrix Hardness:	46 -49 HRc	
Tungsten Carbide Hardness:	2000-2400 HV	
Magnetic Properties:	Slightly magnetic	
Thickness Limit:	up to 3 mm per pass	

Wear analysis

The latest state-of-the-art testing machines and facilities are essential to accurately measure and understand the complex relationship between chemistry, process and application. As well as having fully equipped laboratories with electron microscopes and wear-test facilities, Castolin Eutectic works with world experts in technical universities engaged in testing and modelling.



Mapping of wear surface

Wear simulation test machine

Training

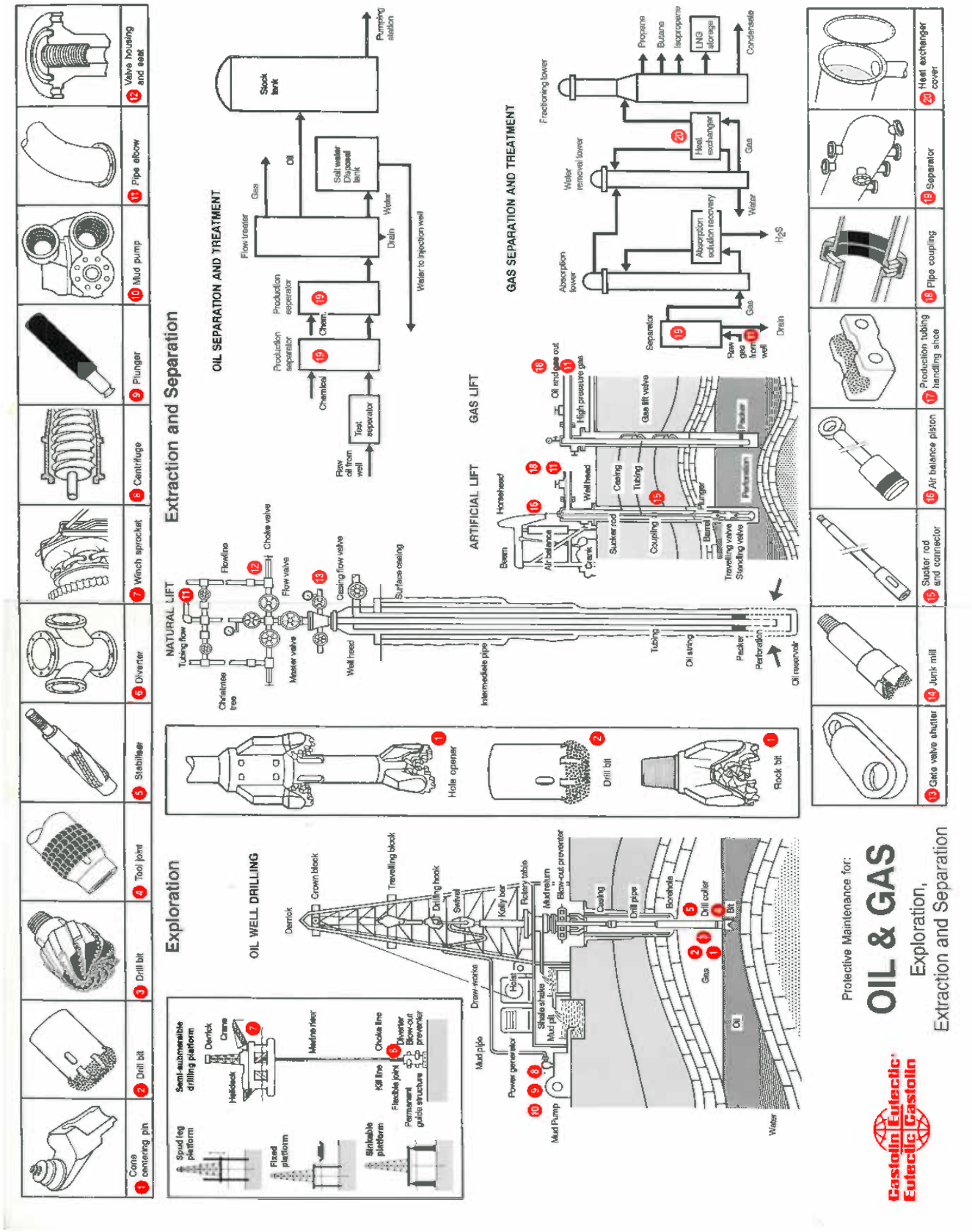
To increase customer know-how in wear technology and repair techniques, we have developed a full line of seminars and training programs, tailored to all relevant personnel, from welders and engineers to sales teams and managing directors.

Castolin Eutectic has trained thousands of technicians worldwide and training centres have been established in most countries, with programmes offered in a wide variety of languages. We offer a full range of courses, starting from one-day welding courses to full-week maintenance seminars.

R&D Laboratory

Research & Development is an important part of our process to deliver the best wear and corrosion protection solutions to our customers' problems. We protect with coatings and ultimately with microstructures. To create real understanding of wear and corrosion and coating performance, you need to anaylse at microscopic levels, with experts and scientific equipment. Castolin Eutectic has the complete range of advanced microstructural and analytical equipment in-house and trained, dedicated staff to run it. Optimised coatings for high performance are the result of : optimised materials and processes combined with the correct coating solution for the specific problem. These elements must be understood and controlled through sound R&D.

Scanning Electron Microscope


Protective Maintenance for:
OIL & GAS
Exploration,
Extraction and Separation
Castolin Eutectic
Eutectic Castolin
Exploration
OIL WELL DRILLING
Extraction and Separation
OIL SEPARATION AND TREATMENT
GAS SEPARATION AND TREATMENT
ARTIFICIAL LIFT
GAS LIFT
NATURAL LIFT
1 Cone centering pin
2 Drill bit
3 Drill bit
4 Tool joint
5 Stabiliser
6 Diverter
7 Winch sprocket
8 Centrifuge
9 Plunger
10 Mud pump
11 Pipe elbow
12 Valve housing and seat
13 Gate valve shutter
14 Junk mill
15 Sucker rod and connector
16 Air balance piston
17 Production tubing handling shoe
18 Pipe coupling
19 Separator
20 Heat exchanger cover

Castolin Eutectic®
Eutectic Castolin

Stronger... with Castolin Eutectic

www.castolin.com

Ask for a demonstration from our OilTec Specialists or for more info contact OilTec.